GETTING STARTED WITH ENSIGHT 7.3

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Introduction

What's in *Getting Started*?

This *Getting Started* manual contains the following information:

- Installation (and verification) instructions (Chapters 1 and 2).
- An introduction to the EnSight user interface (Chapter 3).
- Some simple, step-by-step demonstrations of basic EnSight functionality (Chapters 4–7).

Conventions Used in *Getting Started*

The following typographic conventions are used in the *Getting Started* manual:

A numbered step tells you exactly what to do:

1. Change the value to "0.0" and press return.

UNIX and DOS level commands are denoted in a fixed-width font. Never type the leading "%" – it indicates that the command is to be issued at a shell prompt.

```
% ensight7.client -cm
```

Menu selections use ">" to indicate the selection hierarchy. For example, "Tools > Plane > Line" means to select Plane from the Tools menu and then select Line from the Plane cascade menu.

Notes and warnings provide particularly important information:

Note: Text emphasized in this fashion is a note.

Warning: Text emphasized in this fashion is a warning. Warnings typically indicate that your actions may have unintended consequences.

Where's the Rest?

The remainder of the EnSight documentation is available online. The documentation is divided into two parts:

How To

The How To documentation consists of relatively short articles that describe how to perform a specific operation in EnSight, such as change the color of an object or create an isosurface. Step-by-step instructions and pictures of relevant dialogs are included. In addition, each How To article typically contains numerous hyperlinks (colored blue) to other related articles (and relevant sections of the User Manual).

To access a list of the online How To articles, select Help > How To Table of Contents. A comprehensive index is also available: Help > How To Index.

User Manual

The User Manual provides a detailed reference for EnSight.

To access the User Manual, select Help > User Manual Table of Contents. A comprehensive index is also available: Help > User Manual Index.

Note: When navigating in the online User Manual, you can easily return to the User Manual Table of Contents by clicking on the footer text: EnSight 7 User Manual.

1 Installation For Unix Systems

EnSight is a powerful software package for the postprocessing, visualization, and animation of complex datasets. One of the unique features of EnSight is its ability to run *distributed*, sharing the workload between a Server process (handling data I/O and all compute intensive functions) and a Client process (managing user-interface interaction and graphic rendering). The EnSight Client and Server can either run on the same computer system (*stand-alone* operation) or the Client can run on a workstation and the Server can run on a remote computer system (*distributed* operation).

***Important**: The EnSight client is designed to run on a user's workstation. It is not designed to run on a remote machine due to its interaction with the windowing system and graphics hardware. If it is run on a remote machine, performance will suffer and rendering errors may occur.*

If you are installing EnSight for a trial evaluation, you will be provided with a license key file which permits you to install and execute EnSight in either stand-alone or distributed mode on any computer system at your site for a limited amount of time.

If you have purchased or are leasing a license for EnSight, have chosen to run distributed, and always intend to run the Client processes on the same workstation(s), the easiest method of installation will be to node-lock the Clients to that (those) workstation(s). If however you anticipate running the Client process from a number of different workstations at different times, (the maximum number of concurrent EnSight processes is governed by the number of *seats* for which you are licensed) then you will need to install the *EnSight License Manager*.

What You'll Need For Installation

To install and run EnSight, you will need:

1. A CD-ROM drive attached to a UNIX system.
2. A computer system capable of running the EnSight Client. See Table 1 below for a list of supported EnSight Client host platforms.
3. A computer system capable of running the EnSight Server. See Table 2 below for a list of supported EnSight Server host platforms.
4. If you plan to run EnSight distributed, your networking environment must support the TCP/IP network protocol. If you can run `telnet` from the Client to the Server host system, you have TCP/IP installed. If you have questions, consult your local system administrator.
5. A valid EnSight license key. If the key information was not included with your materials, it will be sent via FAX or email.
6. Sufficient disk space. Approximately 250 MB will be required. Data files, some printable documentation, and some executables can be removed after installation to save space.
7. Sufficient memory. A minimum of 128 MB of memory is recommended for typical usage. If you work with large datasets you will require more.

Per-platform notes:

SGI SGI periodically releases various patches to the IRIX system software. It is vital that all recommended patches be installed for proper EnSight operation. SGI provides patches free over the Internet: see http://www.sgi.com/Support/patch_intro.html. You can tell if a certain patch (in this case, #1447) has been installed by executing:

```
% /usr/sbin/versions | grep 1447
```

If no lines are printed, the patch is *not* installed.

During the installation procedure, you will be asked which operating system you are running. Two choices are provided: IRIX 6.2 (which should be used for IRIX 6.2, 6.3, 6.4 or 6.5 with R4xxx processors), or IRIX 6.5 which should be used only with IRIX 6.5 and R10000 or R12000 processors. If you are installing IRIX 6.5 binaries, you will be provided with two choices for binaries. If it is not obvious which to choose, select the option to view the README file which provides more information.

Sun Solaris 2.6 or later is required. EnSight uses the OpenGL libraries provided by Sun for 3D graphics support for the EnSight Client. These libraries are provided for Solaris 2.5.1 or greater. Execute the following to determine if the libraries are installed:

```
% ls -l /usr/openwin/lib/libGL.so
```

If the response indicates that there is “no such file ...” the OpenGL libraries are *not* installed. Contact Sun for information on how to obtain the libraries. Sun’s OpenGL libraries support essentially all of the available graphics systems that Sun has produced over the past few years. However, only the Creator3D and later boards provide hardware graphics support. Since other boards emulate the graphics in software, performance will be quite limited.

Note that EnSight will only run under the Common Desktop Environment (CDE).

HP Only HP-UX 10.20 or later is supported (11.00 is recommended). If you are running an earlier OS level, you *must* upgrade in order to run EnSight 7.

There are two versions of the EnSight Client available for HP systems. The first uses the OpenGL libraries as distributed by HP and is limited to software rendering on all graphics boards released before the Visualize-*X series (available in September 1997).

Compaq Only Tru64 Unix v5.1 or later is supported. If you are running an earlier OS level, you *must* upgrade in order to run EnSight 7.

IBM Only AIX 4.3 or later is supported. If you are running an earlier OS level, you *must* upgrade in order to run EnSight 7. In addition, you must enable your X server to support OpenGL. See *Post Installation Instructions* on page 1-8 for details.

Linux RedHat 6.x is tested - other distributions based on the Linux 2.2 kernel may work also.

Vendor	Models Supported	Supported OS Levels
SGI	Any model supporting OpenGL	IRIX 6.2, or later
HP with HP-OpenGL	Visualize - FX2/4/5/6/10 any model with direct support for OpenGL	HP-UX 10.20 or later
Sun	Any model with support for OpenGL	Solaris 2.6
Compaq	PowerStorm accelerated graphics Alpha workstations	Tru64 Unix v5.1 or later
IBM	Any model with support for OpenGL	AIX 4.3 or later
Linux	Intel	Kernel 2.2
Linux	Alpha	Kernel 2.2

Table 1: Supported EnSight Client host platforms.

Vendor	Models Supported	Supported OS Levels
SGI	All	IRIX 6.2, or later
HP	All PA-7000/8000 systems	HP-UX 10.20 or later
Sun	All Sparc systems	Solaris 2.6 or later
Compaq	All Alpha systems	Tru64 Unix v5.1 or later
IBM	RS-6000, SP2	AIX 4.3 or later
Cray	Y-MP, C90, T90, J90	UNICOS 9 or 10
NEC	SX-4	SUPER-UX Release R7.2
Linux	Intel	Kernel 2.2
Linux	Alpha	Kernel 2.2

Table 2: Supported EnSight Server host platforms

Installation Summary

For users with a CD-ROM drive attached to the system on which EnSight will be installed, the instructions can be summarized as follows:

1. Insert the CD-ROM.
2. Mount the CD-ROM drive.
3. Select an installation directory.
4. Execute the installation script and follow the instructions.
5. Execute any required post-installation steps.
6. Set up the required license key(s) for your environment.
7. If the Client seats are to float, start the EnSight License Manager.

If you do not have a CD-ROM attached to the system on which EnSight will be installed, the following steps apply:

1. Insert the CD-ROM.
2. Mount the CD-ROM drive.
3. Select a temporary installation directory.
4. Execute the installation script and follow the instructions.
5. Pack up the installed files, move them to the desired host, and unpack.
6. Execute any required post-installation steps.
7. Set up the required license key(s) for your environment.
8. If the Client seats are to float, start the EnSight License Manager.

Contacting CEI

Should you encounter problems in your installation or use of EnSight, please contact CEI support:

Email: ensight_support@ceintl.com
Hotline: 800-551-4448 (U.S)
919-363-0883 (Non-U.S.)
Fax: 919-363-0833

1.1 Installation

The installation instructions are divided into the following five sections:

- Mounting the CD-ROM and Mounting the CD-ROM on an HP System
- Installing on systems with an attached CD-ROM drive
- Installing on systems without an attached CD-ROM drive
- Post installation instructions
- Installing the EnSight license key

Mounting the CD-ROM Drive

Note: *For mounting the CD on an HP system, see the next section.*

1. The EnSight CD was written under ISO9660 using Rockridge extensions. Insert the EnSight CD into the CD-ROM drive. The drive must either be attached to the system on which EnSight will be installed OR be attached to a machine that is accessible (over the network) from the desired installation machine.

On many machines, the CD-ROM drive is mounted automatically when a disk is inserted. To check for this, execute the `df` command. On many SGI systems, the CD-ROM will be automatically mounted on `/CDROM`. On a Sun system running `vold`, the CD-ROM will be mounted on `/cdrom/cdrom0`.

The directory on which the CD-ROM is mounted will be referred to as ***`CDROM_DIR`***. If the CD-ROM is mounted, proceed to the next section (note that most SGI systems will now automount CD-ROMs).

2. If you do not see the CD-ROM mounted, you will have to mount it manually (or consult your local system administrator). To mount it manually (note that you will require root permission to perform this operation):

```
% mkdir /cdrom
```

3. Execute the applicable mount command for your system. Note that the actual device name (the parameter after the "-r" flag) will depend on how your system is set up.

Note: *The commands shown below are only examples. The actual command for your system will depend on your platform, OS level, and system setup. See the man page on* `mount` *or your local system administrator for more information.*

System	Sample Mount commands
SGI	`/sbin/mount -t iso9660 -r /dev/rdsk/dks1d4vol /cdrom`
Sun	`/sbin/mount -f hsfs -r /dev/dsk/c0t6d0s0 /cdrom`
Compaq	`/usr/sbin/mount -t cdfs -r -o rrip /dev/rz4c /cdrom`
IBM	`/usr/sbin/mount -v cdrfs -r /dev/cd0 /cdrom`

The directory on which the CD-ROM is mounted will be referred to as ***`CDROM_DIR`*** in the following text.

Mounting the CD-ROM Drive on an HP system

1. Insert the EnSight CD into the CD-ROM drive. The drive must either be attached to the system on which EnSight will be installed OR be attached to a machine that is accessible (over the network) from the desired installation machine.
2. The EnSight CD was written under ISO9660 using Rockridge extensions, so you must mount the CD using pfs_mount:

```
% pfs_mountd &
% pfsd 4 &
% pfs_mount -t rrip -x unix /dev/dsk/c2t2d0 /cdrom
                                          |-----|
                                       site specific
```

Note: *pfs_mount has a bug. If you see the error message "pfs_mount: Not owner", or "pfs_mount:giving up on /cdrom" you must edit /etc/group and make sure that root belongs to 8 or less groups. If not, you must take root out of some of the groups to meet this condition, then logout and back in to try mounting again.*

Installation for Systems with Attached CD-ROM Drives

If your CD-ROM drive is attached to the system on which you wish to install EnSight, then perform the steps described here. If not, then skip to the next section.

These instructions describe how to install the EnSight Client, Server, and/or EnSight License Manager.

1. Select an installation directory. A typical choice is `/usr/local/bin`. In the discussion below, this directory will be referred to as *`INSTALL_DIR`*. Be sure you have write permission (and sufficient disk space) in this directory before proceeding. If the directory is write protected, you may require root (superuser) status to perform the install.
2. Be sure the CD is inserted and change the directory to *`CDROM_DIR`* (be sure to replace *`CDROM_DIR`* with the directory on which your CD-ROM is mounted as described in the previous section):

```
% cd CDROM_DIR
```

   On an HP system:

```
% cd /cdrom
```

3. Execute the installation script:

```
% ./install_unix
```

4. Follow the instructions as prompted to install a Client, Server, and/or EnSight License Manager into your selected *`INSTALL_DIR`*. (If you are installing EnSight for evaluation or for permanent use with the Server and Client as node-locked, you will not need to install the EnSight License Manager).

Proceed to *Post Installation Instructions* on page 1-8.

Installation for Systems without Attached CD-ROM Drives

If you wish to install EnSight on a system that does not have an attached CD-ROM drive, then perform the steps described here. Two machines are discussed here: the system on which EnSight will be installed (referred to as *INSTALL_HOST*) and the system on which the CD-ROM drive is attached (referred to as *CDROM_HOST*).

1. On *CDROM_HOST*, select a temporary installation directory. In the discussion below, this directory will be referred to as *TMP_INSTALL_DIR*. Be sure you have write permission (and sufficient disk space) in this directory before proceeding. If the directory is write protected, you may require root (superuser) status to perform the install.
2. Be sure the CD is inserted and change directory to *CDROM_DIR* (be sure to replace *CDROM_DIR* with the directory on which your CD-ROM is mounted as described in the section above *Mounting the CD-ROM Drive*):

   ```
   % cd CDROM_DIR
   ```

   On an HP system:

   ```
   % cd /cdrom
   ```

3. Execute the installation script:

   ```
   % ./install_unix
   ```

4. Follow the instructions as prompted to extract a Client, Server, and/or EnSight License Manager into your selected *TMP_INSTALL_DIR*. (If you only need to install a Client on *INSTALL_HOST*, there is no need to extract the Server files as well.)
5. Change directory to *TMP_INSTALL_DIR*:

   ```
   % cd TMP_INSTALL_DIR
   ```

6. Pack up the distribution files using the `tar` command and compress:

   ```
   % tar -cvf ensight73.tar ensight73
   % compress ensight73.tar
   ```

7. On *INSTALL_HOST*, select an installation directory. A typical choice is `/usr/local/bin`. In the discussion below, this directory will be referred to as *INSTALL_DIR*. Be sure you have write permission (and sufficient disk space) in this directory before proceeding. If the directory is write protected, you may require root (superuser) status to perform the install.
8. Copy the `ensight73.tar.Z` file from *CDROM_HOST* to the *INSTALL_DIR* directory you just created on *INSTALL_HOST*. This can be accomplished using `ftp` or some other file transfer mechanism. Unless you wish to install on additional systems, you can remove *TMP_INSTALL_DIR*/`ensight73.tar.Z` from *CDROM_HOST*.

The remaining steps are performed on *INSTALL_HOST*.

9. On *INSTALL_HOST*, change directory to *INSTALL_DIR*:

   ```
   % cd INSTALL_DIR
   ```

10. Unpack and remove the tar file:

    ```
    % zcat ensight73.tar.Z | tar -xvf -
    % rm ensight73.tar.Z
    ```

11. Be sure permissions are set correctly:

    ```
    % cd ensight73
    % ./set_permissions
    ```

Proceed to the next section.

Post Installation Instructions

Note that the installation script did not off-load all the information contained on the distribution CD. In particular, the CD also contains additional sample datasets (in the `ensight73/other_data` directory).

Adobe Acrobat .pdf files for local printing of all EnSight 7 documentation were installed in the *`INSTALL_DIR`*`/ensight73/doc/Manuals` directory (see *Printing the documentation* on page 4-21 for more information).

Before EnSight can be run, *all* users must set certain environment and shell variables. In the discussion below, *`MACHINE`* refers to the architecture for the EnSight client and/or server (such as `ibm_4.3_32`, `sgi_6.2_o32`, etc as defined during installation).

All Users

All users (no matter what shell interpreter is used) must add the following commands to their ~/`.cshrc` file. Be sure to replace *`INSTALL_DIR`* and *`MACHINE`* with the appropriate values as selected above.

```
setenv ENSIGHT7_HOME INSTALL_DIR/ensight73
setenv ENSIGHT7_ARCH MACHINE
set path = ( $path $ENSIGHT7_HOME/bin )
```

You will have to log out and back in again for these changes to take effect.

The environment variables have the following meanings:

`ENSIGHT7_HOME`
: The EnSight installation directory.

`ENSIGHT7_ARCH`
: The architecture of the desired host platform. It must be the directory name of one of the valid architectures that have been installed (for example, `sgi_6.2_o32`, `ibm_4.3_32`, `hp_TGS`, `cray_ymp`, etc).

In addition, the following environment variables can be set to change the behavior of EnSight:

`ENSIGHT7_INPUT`
: A dynamic input device library to load with EnSight. May be set to an input device name (i.e. polhemus) to load from `$(ENSIGHT7_HOME)/machines/$(ENSIGHT7_ARCH)/lib_input` or to a full path name to load from a user-specified location.

`ENSIGHT7_READER`
: A directory which contains additional user-defined readers to be loaded before any user-defined readers that are part of the EnSight distribution.

  If you need this capability, please see the README file in `$ENSIGHT7_HOME/ensight73/user_defined_src/readers/` for more information.

`ENSIGHT7_MAX_THREADS`
: The maximum number of threads to use for each EnSight server. Threads are used to accelerate the computation of streamlines, clips, isosurfaces, and other compute-intensive operations. At this time threads are supported on IRIX 6.5,

HP-UX 11.0, Tru64 Unix v5.1, AIX 4.3, Solaris 8, and Linux 2.2 operating systems. Additional support may be added in the future. A maximum of 2 threads may be used with a Standard license, while 128 threads are allowed with a Gold license.

`ENSIGHT7_MAX_CTHREADS`

The maximum number of threads to use for each EnSight client. Beginning with EnSight 7.2, this variable is introduced for future work on parallelizing computation in the client, possibly including normal generation, color mapping, and transparency sorting. The same 2 thread limitation applies for a Standard license.

`ENSIGHT7_MAX_SOSTHREADS`

The maximum number of threads to use for each EnSight server-of-servers. Beginning with EnSight 7.2, this variable is introduced for future work on parallelizing the merging of data in the server-of-servers. As the server-of-servers is a Gold feature, the limit for threads is 128.

Bourne Shell Users

For Bourne Shell (`/bin/sh`) users, the following commands must be added to their `~/.profile` file. Be sure to replace *`INSTALL_DIR`* and *`MACHINE`* with the appropriate values as selected above.

```
ENSIGHT7_HOME=INSTALL_DIR/ensight73
export ENSIGHT7_HOME
ENSIGHT7_ARCH=MACHINE
export ENSIGHT7_ARCH
PATH=$PATH:$ENSIGHT7_HOME/bin
export PATH
```

You will have to log out and back in again for these changes to take effect.

Platform-specific settings

Certain systems require additional settings.

IBM The X Server must be started with the OpenGL extension. There are a number of ways this can be done under the Common Desktop Environment. See `/usr/lpp/OpenGL/README` for information.

Sun All EnSight users must set the appropriate environment variables in order to access the OpenGL, Motif, and X11 libraries. For C Shell users, add the following lines to your `~/.cshrc` file (since these paths depend on your installation, consult your local system administrator for the actual values):

```
setenv OPENWINHOME /usr/openwin
setenv MOTIFHOME /opt/SUNWspro/Motif_Solaris24/dt
setenv LD_LIBRARY_PATH \
“${LD_LIBRARY_PATH}:/opt/SUNWspro/lib:$OPENWINHOME/lib:$MOTIFHOME/lib”
```

For Bourne Shell users, add the following lines to your `~/.profile` file (since these paths depend on your installation, consult your local system administrator for the actual values):

```
OPENWINHOME=/usr/openwin
export OPENWINHOME
MOTIFHOME=/opt/SUNWspro/Motif_Solaris24/dt
export MOTIFHOME
LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/opt/SUNWspro/lib
LD_LIBRARY_PATH=$LD_LIBRARY_PATH:$OPENWINHOME/lib:$MOTIFHOME/lib
export LD_LIBRARY_PATH
```

(If the Motif directory `/opt/SUNWspro/Motif_Solaris24/dt` does not exist, set `MOTIFHOME` to `/usr/dt`.)

Installing the EnSight License Keys

You should have received an EnSight license key file from your EnSight representative. (If not, please contact CEI or your local distributor of EnSight). The following provides a brief overview of the EnSight keying mechanism. The information provided is not critical to the installation process: you can skip it or return to it later if desired.

Keying Overview

The EnSight Client software can be installed either *node-locked* or *floating*. The choice for your installation was made when you purchased EnSight or requested a trial evaluation.

In a node-locked EnSight Client installation, the systemID numbers for all EnSight Client systems were provided to CEI. The Client will read the license key file (`slim7.key`) to determine if it is running on a licensed host. The key file also contains information on the licensing company and expiration date.

Note: *If you are installing for a trial evaluation, you will normally be installing EnSight as node-locked. Trial installations will use a key file which allows node-locked operation on any computer system at your site for a limited time.*

The advantage of a node-locked EnSight Client installation is that it is simple to install – only the `slim7.key` file is required. The disadvantage is that you will only be permitted to run the EnSight Client on those workstations for which you have submitted systemID numbers.

If you have purchased or are leasing an EnSight license, you have the additional option of a floating EnSight Client installation in which the Client reads the `slim7.key` file as before. However, the file now contains information concerning which IP networks are valid for the license. In addition, the number of permitted *seats* (concurrent executions) is tracked using the EnSight's *Simple License Manager* (or SLiM). The advantage of a floating EnSight Client installation is that EnSight can be executed from any workstation within the given IP network as long as the maximum seat count has not been exceeded. The disadvantage is that a system daemon (slimd) must be installed and run in order to track the seat count.

Key Installation

The contents of the `slim7.key` file are provided by your EnSight representative.

Note: *All machines which will execute the EnSight Client* **must** *have access to the key file. The Client process will always look for the file in the $ENSIGHT7_HOME/license directory.*

1. Change directory to the `license` subdirectory:

   ```
   % cd INSTALL_DIR/ensight73/license
   ```

2. Create the `slim7.key` file by doing either a) or b):
   a. If you received your key contents via email, use a text editor (*e.g.* `vi` or `emacs`) to create the file `slim7.key`, then copy into it the appropriate contents from the email, save the file, and exit the editor.
   b. If you did not receive the key contents by email, you will have to type them from the printed information you have received. Using a text editor (*e.g.* `vi` or `emacs`), create the file `slim7.key`. Enter the text *exactly* as shown – in particular be careful with uppercase `O` and zero (`0`). Save the file and exit the text editor.

   Be sure the `slim7.key` file is readable by all users of EnSight. Execute:

   ```
   % chmod 644 slim7.key
   ```

If you are installing a node-locked license, your installation is complete. You should now proceed to *Verifying the Installation* on page 1-15. If you encountered problems, please consult *Troubleshooting the Installation* on page 1-14 before contacting CEI support.

If you are installing EnSight's Simple License Manager, continue. Your designated host system will act as your license manager server and is referred to here as *LM_HOST*. The `slim7.key` file contains a `slimd` line that describes *LM_HOST* (the third word on the line is the name of the system). Most installations will run a single copy of the EnSight License Manager and will therefore have only one `slimd` line. However, it is possible to run multiple (redundant) license managers. If this was requested, your `slim7.key` file will have a `slimd` line for each host. Execute the following steps for each host, replacing *LM_HOST* as appropriate.

1. Log on to *LM_HOST*.

   Note: If you haven't previously installed the SLiM license manager, rerun the installation script on the EnSight CD and install the SLiM license manager for your machine's architecture. See *Installation* on page 1-5 **for additional instructions.**

2. Change directory to the `license` subdirectory:

   ```
   % cd INSTALL_DIR/ensight73/license
   ```

3. Create the file `slim7.key` key by doing either a) or b):

   a. If you received your key contents via email, use a text editor (*e.g.* `vi` or `emacs`) to create the file `slim7.key`, then copy into it the appropriate contents from the email, save the file, and exit the editor. If the machine on which you created the file is not the same as *LM_HOST*, you must move (using `ftp` or some other file transfer mechanism) `slim7.key` to the directory `$ENSIGHT7_HOME/license` on *LM_HOST*.

   b. If you did not receive the key contents by email, you will have to type them from the printed information you have received. Using a text editor (*e.g.* `vi` or `emacs`), create the file `slim7.key`. Enter the text *exactly* as shown – in particular be careful with uppercase O and zero (0). Save the file and exit the text editor.

4. The EnSight License Manager server will listen for connections on the socket port number given as the first number on the applicable `slimd` line of the `slim7.key` file. If you did not specify a desired port number when you requested your key, port number 7790 is used. If this number conflicts with other usage at your site, you CANNOT change the key file – contact CEI for a new key.

5. Start the EnSight License Manager daemon. (Note that both `$ENSIGHT7_HOME` and `$ENSIGHT7_ARCH` must be set correctly for these scripts to work – even if all you are installing is the license manager.)

   ```
   % ./slimd_start
   ```

6. To check that the daemon is running properly:

   ```
   % ./slimd_status
   ```

The output should indicate that "slimd is running". The Simple License Manager (SLiM) is now running (if not, see *Troubleshooting the Installation* on page 1-14). If you need to stop the daemon at any time, execute `slimd_stop`.

If the license manager host is rebooted, the daemon will need to be restarted. On systems that are restarted infrequently, this is not a problem. However, you may want to consider adding the `slimd_start` program to your system's boot procedures (remember to set both `$ENSIGHT7_HOME` and `$ENSIGHT7_ARCH` prior to executing `slimd_start`). Consult your local system administrator for assistance.

This completes the installation process. You should now proceed to *Verifying the Installation* on page 1-15. If you encountered problems, please consult *Troubleshooting the Installation* on page 1-14 before contacting CEI support.

Additional information regarding SLiM can be found in $ENSIGHT7_HOME/license/README.txt.

1.2 Troubleshooting the Installation

Problem	Probable Causes	Solution
CD-ROM does not mount or read	CD not inserted	Insert the EnSight CD.
	System problem	Consult your local system administrator.
EnSight's Simple License Manager daemon does not start	Several potential causes	Check the Simple License Manager log file (`$ENSIGHT7_HOME/license/slimd-log-`*`HOST`*`.txt` where *`HOST`* is the license manager host name) for error messages and correct as necessary. Review: `$ENSIGHT7_HOME/license/README.txt` Check system log file.

1.3 Verifying the Installation

Verifying installation is simple: the EnSight Client is started and the EnSight Server is connected to it. In the instructions that follow, *CLIENT_HOST* refers to the system on which the EnSight Client was installed and *SERVER_HOST* refers to the system on which the EnSight Server was installed. If the installation is stand-alone, then *CLIENT_HOST* and *SERVER_HOST* actually refer to the same system.

The instructions also assume that the environment variables ENSIGHT7_HOME, and ENSIGHT7_ARCH, as well as the command search path have been set up correctly as described in the preceding section.

Starting EnSight for Stand-alone Use

If your installation of EnSight is stand-alone (*i.e.* the Client and Server are both running on the same workstation), you will perform an auto-connect of the EnSight Client and Server processes.

You should be logged in to the console of the workstation on which the EnSight Client and Server have been installed. In a the shell window, start EnSight using the ensight7 shell script:

```
% ensight7
```

This shell script will automatically start the Client and the Server and make the connection. You can tell if the connection was successful by clicking the Info... button on the right of the desktop and seeing “Connection accepted” in the EnSight Message Window. Licensing information (licensee and expiration date) should also appear in the lower left corner of the Graphics Window. You can now close the EnSight Message Window and proceed to Chapter 3.

If the connection failed, please consult the next section (*Troubleshooting the Connection*) before contacting CEI support.

Starting EnSight for Distributed Use

Starting the Client

1. Log on to the console of *CLIENT_HOST* and open at least two shell windows. Since the EnSight user interface will open on the right side of your screen, place the two shell windows on the left side.
2. In one of the shell windows, start the EnSight Client:

   ```
   % ensight7.client -cm
   ```

   The -cm option tells the Client to begin listening for a connection from the Server. The EnSight Client user interface should appear on your workstation screen.

Starting the Server

3. In a different shell window on your workstation, log on to *SERVER_HOST* :

   ```
   % telnet SERVER_HOST
   ```

4. In the same shell window as step 3, start the EnSight Server:

   ```
   % ensight7.server -c CLIENT_HOST
   ```

   The -c *CLIENT_HOST* option tells the EnSight Server to connect to the EnSight Client listening on *CLIENT_HOST.*

You can tell if the connection was successful by clicking the Info... button on the right of the desktop and seeing “Connection accepted” in the EnSight Message Window (see the image below). Licensing information (licensee and expiration date) should also appear in the lower left corner of the Graphics Window. You should now proceed to Chapter 3.

If the connection failed, please consult the next section (*Troubleshooting the Connection*) before contacting CEI support.

The EnSight Client after a successful connection with the Server process. Note the licensing information in the lower left corner of the Graphics Window.

1.4 Troubleshooting the Connection

Problem	Probable Causes	Solution
EnSight Client and/or Server fails to start.	Client and/or Server executables are not found in the user's command search path. The environment variable(s) `ENSIGHT7_HOME` and/or `ENSIGHT7_ARCH` are not set correctly.	Set the appropriate path and environment variables on both *`CLIENT_HOST`* and *`SERVER_HOST`* as described in the previous section.
Client starts, but Server fails to start.	The environment variable(s) `ENSIGHT7_HOME` and/or `ENSIGHT7_ARCH` are not set correctly and the license key is not found on *`SERVER_HOST`*.	Set all environment variables as described in the previous section.
Client and Server start, but manual connection fails.	Incorrect *`CLIENT_HOST`* provided to the Server.	Double-check your Client's host name: run the `hostname` command on the Client system. Use the resulting name when starting the Server: `ensight7.server -c` *`CLIENT_HOST`*
	Possible networking problem.	Be sure you can `telnet` from *`CLIENT_HOST`* to *`SERVER_HOST`*. If not, consult your local system administrator for assistance.
	EnSight socket ports (1105 and 1106) are in use.	Quit the Client. Execute the netstat command: *`your_path`*`/netstat -a | grep 110` on both *`CLIENT_HOST`* and *`SERVER_HOST`*. If either 1105 or 1106 is listed, reboot the system. If the problem persists, contact CEI support. Note: *`your_path`* will vary according to machine and OS, typically, for sgi: /usr/etc for linux: /bin; for HP,IBM,Sun: /usr/bin; and for Compaq: /usr/sbin
Wrong license or license cannot be found	The `slim7.key` file is not properly installed in the `$ENSIGHT7_HOME/license` directory	Make sure the license key(s) have been installed correctly and that all users have read permission for the file(s). Review: `$ENSIGHT7_HOME/license/README.txt`

1.5 Where's the Rest?

After installing EnSight, you should proceed to the Chapter 3, *EnSight Graphical User Interface* for an introduction to the user interface and details on how to interact with EnSight.

2 Installation For NT Systems

EnSight is a powerful software package for the postprocessing, visualization, and animation of complex datasets. One of the unique features of EnSight is its ability to run *distributed*, sharing the workload between a Server process (handling data I/O and all compute intensive functions) and a Client process (managing user-interface interaction and graphic rendering). The EnSight Client and Server can either run on the same computer system (*stand-alone* operation) or the Client can run on a workstation and the Server can run on a remote computer system (*distributed* operation).

***Important**: The EnSight client is designed to run on a user's workstation. It is not designed to run on a remote machine due to its interaction with the windowing system and graphics hardware. If it is run on a remote machine, performance will suffer and rendering errors may occur.*

If you are installing EnSight for a trial evaluation, you will be provided with a license key file which permits you to install and execute EnSight in either stand-alone or distributed mode on any computer system at your site for a limited amount of time.

If you have purchased or are leasing a license for EnSight, have chosen to run distributed, and always intend to run the Client processes on the same workstation(s), the easiest method of installation will be to node-lock the Clients to that (those) workstation(s). If, however, you anticipate running the Client process from a number of different workstations at different times, (the maximum number of concurrent EnSight processes is governed by the number of *seats* for which you are licensed) then you will need to install the *EnSight License Manager*.

What You'll Need For Installation

To install and run EnSight, you will need:

1. The Ensight 7 CD.
2. A PC workstation capable of running the EnSight software. The system should conform to the following:
   * OS must be Windows NT 4.0 with Service Pack 3 or later, or Windows 2000.
   * A Network Interface Card
   * Microsoft TCP/IP installed
   * NetBIOS service installed
   * A video board providing hardware accelerated OpenGL support is highly recommended. For a list of boards that have been tested by CEI and their respective performance, see the README.performance file located in the performance folder.
   * A minimum of 64MB of memory. 128 MB or more is recommended.
   * 300MHz or faster CPU is recommended
   * A screen resolution of at least 1024 by 768 is recommended.
3. Sufficient disk space. Typically, approximately 150 MB of disk space will be needed.
4. A valid EnSight license key. If the key information was not included with your materials, it will be sent via FAX or email.

Contacting CEI

Should you encounter problems in your installation or use of EnSight, please contact CEI support:

Email:	ensight_support@ceintl.com
Hotline:	800-551-4448 (U.S)
	919-363-0883 (Non-U.S.)
Fax:	919-363-0833

2.1 Installation

The installation instructions are divided into the following three sections:

- Installation Procedure
- Post installation instructions
- Installing the EnSight license key

Installation Procedure

In order to install the EnSight software you will need to be logged in as administrator, or have administrator privileges.

To install the EnSight software:

1. Place the EnSight CD in your CD-ROM drive.
2. Open NT Explorer.
3. Double click on Setup.exe in the top directory of the CD.
4. Follow the instructions as prompted by the setup program.

Once the installation is complete, the NT machine must be rebooted in order for EnSight environment variables to take effect.

Post Installation Instructions

Acrobat .pdf files for local printing of all EnSight 7 documentation were installed in the *INSTALL_DIR*/ensight73/doc/Manuals directory during installation (see *Printing the documentation* on page 4-21 for more information).

EnSight requires that both TCP/IP and NetBIOS interface services are available. To check this, from the Control Panel (Start > Settings > Control Panel):

1. Open the Network Panel.
2. Check to make sure that NetBIOS is in the list under Services, and that TCP/IP is available under Protocols.

The EnSight installation procedure sets the necessary environment variables for executing the EnSight software. However, if you wish to inspect these variables, do the following:

1. Open the Systems Panel.
2. Open the Environment tab and check that the following is defined under the system are:
   ENSIGHT7_HOME - should contain the path of the EnSight7 directory where you installed the EnSight software. This will typically be:
   "C:\Program Files\CEI\EnSight73".

   PATH - should have appended to it the EnSight client and server directory paths. This will typically be:
   "C:\Program Files\CEI\EnSight73\machines\win32"

Installing the EnSight License Keys

You should have received an EnSight license key file from your EnSight representative. (If not, please contact CEI or your local distributor of EnSight). The following provides a brief overview of the EnSight keying mechanism. The information in the Overview provided is not critical to the installation process: you can skip it or return to it later if desired.

Keying Overview

The EnSight Client software can be installed either *node-locked* or *floating*. The choice for your installation was made when you purchased EnSight or requested a trial evaluation.

In a node-locked EnSight Client installation, the systemID numbers for all EnSight Client systems were provided to CEI. The Client process will read the license key file (`slim7.key`) to determine if it is running on a licensed host. The key file also contains information on the licensing company and expiration date.

Note: *If you are installing for a trial evaluation, you will normally be installing EnSight as node-locked. Trial installations will use a key file which allows node-locked operation on any computer system at your site for a limited time.*

The advantage of a node-locked EnSight Client installation is that it is simple to install – only the `slim7.key` file is required. The disadvantage is that you will only be permitted to run the EnSight Client on those workstations for which you have submitted systemID numbers.

If you have purchased or are leasing an EnSight license, you have the additional option of a floating EnSight Client installation in which the Client reads the `slim7.key` file as before. However, the file now contains information concerning which IP networks are valid for the license. In addition, the number of permitted *seats* (concurrent executions) is tracked using the EnSight's *Simple License Manager* (or SLiM). The advantage of a floating EnSight Client installation is that EnSight can be executed from any workstation within the given IP network as long as the maximum seat count has not been exceeded. The disadvantage is that a system daemon must be installed and run in order to track the seat count.

Key Installation

The contents of the `slim7.key` file are provided by your EnSight representative.

Note: *All machines which will execute the EnSight Client* **must** *have access to the key file. The Client process will always look for the file in the %ENSIGHT7_HOME%\license directory.*

1. Create the `slim7.key` file, which must be located in the %ENSIGHT7_HOME%\license directory, by doing either a) or b):
   a. If you received your key contents via email, use a text editor (*e.g.* notepad) to create the file `slim7.key`, then copy into it the appropriate contents from the email, save the file, and exit the editor.
   b. If you did not receive the key contents by email, you will have to type them from the printed information you have received. Using a text editor (*e.g.* notepad), create the file `slim7.key`. Enter the text *exactly* as shown – in particular be careful with uppercase `O` and zero (`0`). Save the file and exit the text editor.

If you are installing a node-locked license, your installation is complete. You should now proceed to *Verifying the Installation* on page 2-8. If you encountered problems, please consult *Troubleshooting the Installation* on page 2-7 before contacting CEI support.

If you are installing the EnSight's Simple License Manager, continue. Your designated host system will act as your license manager server and is referred to here as *LM_HOST*. The `slim7.key` file contains a `slimd` line that describes *LM_HOST* (the third word on the line is the name of the system). Most installations will run a single copy of the EnSight License Manager and will therefore have only one `slimd` line. However, it is possible to run multiple (redundant) license managers. If this was requested, your `slim7.key` file will have a `slimd` line for each host. Execute the following steps for each host, replacing *LM_HOST* as appropriate.

2. Log on to *LM_HOST*.
3. Create the file `slim7.key` key, which must be located in the %ENSIGHT7_HOME%\license directory, by doing either a) or b):
   a. If you received your key contents via email, use a text editor (*e.g.* notepad) to create the file `slim7.key`, then copy into it the appropriate contents from the email, save the file, and exit the editor.
   b. If you did not receive the key contents by email, you will have to type them from the printed information you have received. Using a text editor (*e.g.* notepad), create the file `slim7.key`. Enter the text *exactly* as shown – in particular be careful with uppercase O and zero (0). Save the file and exit the text editor.

If you installed the EnSight License Manager on your system using the Setup program, it will have transferred the executable files to your system. If your system is running Microsoft Windows NT you can optionally install the License Manager (`slimd_service.exe`) as a system service. Other versions of Microsoft Windows can run the License Manager as a normal process (`slimd.exe`). Under Windows NT you can also install or uninstall the EnSight License Manager service at any time by running the program `slimnstl.exe`, which is found in the `%ENSIGHT7_HOME%\machines\win32` directory.

If the EnSight License Manager was installed as a NT service (`slimd_service`), it will attempt to start automatically each time you boot your system. It will not be able to start until you have placed a valid key file (`slim7.key`) in the license directory, however. To check on its status, or to start it manually after creating your key file, go to Start > Settings > Control Panel and open the Services dialog. The `slimd_service` should appear in the list of services. If it is running, its status should be listed as "started". You can also start it manually by selecting it and clicking the dialog's "Start" button.

If the EnSight License Manager was installed as a normal process, you will need to start it up manually by running `slimd.exe`.

You can also check the License Manager's status by double-clicking on `slimd_status.exe` in the `%ENSIGHT7_HOME%\machines\win32` directory. This program will contact the license manager and display a status message.

If the `slimd_service` fails to start automatically when your system comes up, check the system and/or application error logs (using the Event Viewer) for possible error messages. You should also check the slimd log

(`%ENSIGHT7_HOME\license\slimd-log-HOST.txt`). Note that the ENSIGHT7_HOME environment variable must be set for your system to run the license manager, even if you did not install the EnSight client or server.

The EnSight License Manager service will listen for connections on the socket port number given at the end of the applicable `slimd` line of the `slim7.key` file. If you did not specify a desired port number when you requested your key, port number 7790 is used. If this number conflicts with other usage at your site, you CANNOT change the key file – contact CEI for a new key.

This completes the installation process. You should now proceed to *Verifying the Installation* on page 2-8. If you encountered problems, please consult *Troubleshooting the Installation* on page 2-7 before contacting CEI support.

2.2 Troubleshooting the Installation

Problem	Probable Causes	Solution
CD-ROM does not mount or read	CD not inserted	Insert the EnSight CD.
	System problem	Consult your local system administrator.
EnSight's Simple License Manager daemon does not start	ENSIGHT7_HOME not defined or incorrect	Set ENSIGHT7_HOME environment variable.
	Key file not valid	Inspect the slim7.key file for blank lines or extra characters at end of lines
	slimd_service not installed as windows service.	Make sure slimd_service.exe is present in `%ENSIGHT7_HOME%\machines\win32` directory, run slimnstl.exe
	slimd_service service not started	Start manually or see system and/or application error logs for autostart failure cause. Check the slimd-log-HOST.txt log. Review: `$ENSIGHT7_HOME/license/README.txt`

2.3 Verifying the Installation

Verifying installation is simple: the EnSight Client is started and the EnSight Server is connected to it. In the instructions that follow, *CLIENT_HOST* refers to the system on which the EnSight Client was installed and *SERVER_HOST* refers to the system on which the EnSight Server was installed. If the installation is stand-alone, then *CLIENT_HOST* and *SERVER_HOST* actually refer to the same system.

The instructions also assume that the environment variables ENSIGHT7_HOME and PATH have been set up correctly as described in the preceding section.

Starting EnSight for Stand-alone Use

If your installation of EnSight is stand-alone (*i.e.* the Client and Server are both running on the same workstation), you will perform an auto-connect of the EnSight Client and Server processes.

Choose EnSight7 from the Start menu > Programs toolbar.

This will automatically start the Client and the Server and make the connection. If the connection is successful, you should see "Connection accepted" in the Status History area (just below the upper right corner of the EnSight window). Licensing information (licensee and expiration date) should also appear in the lower left corner of the Graphics Window. You should now proceed to Chapter 3.

If the connection failed, please consult the next section (*Troubleshooting the Connection*) before contacting CEI support.

Starting EnSight for Distributed Use

Starting the Client

1. Log on to the *CLIENT_HOST*. Double click the ens7cl.exe icon located in the *INSTALL_DIRECTORY*\machines\win32 folder.
2. Bring the Connection dialog up, by File > Connect Server...
3. Change the "Type" to "Manual".
4. Click the "Connect Server" button.

Starting the Server

5. If the *SERVER_HOST* is a UNIX machine, follow the "Starting the Server" instructions in Chapter 1. If the *SERVER_HOST* is a NT machine, continue with these instructions.

   Log on to the *SERVER_HOST*. Double click (or run, if you telnet to the machine) the ens7sv.exe icon located in the *INSTALL_DIRECTORY*\machines\win32 folder.
6. In the resulting application console window, enter the name of the *CLIENT_HOST* machine.

If the connection is successful, you should see "Connection accepted" in the Status History area (see the image on the next page). Licensing information (licensee and expiration date) should also appear in the lower left corner of the Graphics Window. You should now proceed to Chapter 3.

If the connection failed, please consult the next section (*Troubleshooting the Connection*) before contacting CEI support.

The EnSight Client after a successful connection with the Server process. Note the licensing information in the lower left corner of the Graphics Window. (Unix image, NT is similar)

2.4 Troubleshooting the Connection

Problem	Probable Causes	Solution
EnSight Client and/or Server fails to start.	Client and/or Server executables are not found in the user's command search path. The environment variable(s) `ENSIGHT7_HOME` or `PATH` are not set correctly.	Set the appropriate path and environment variables on both *`CLIENT_HOST`* and *`SERVER_HOST`* as described in the previous section.
Client starts, but Server fails to start.	The environment variable(s) `ENSIGHT7_HOME` or `PATH` are not set correctly and the license key is not found on *`SERVER_HOST`*.	Set all environment variables as described in the previous section.
Client and Server start, but manual connection fails.	Incorrect *`CLIENT_HOST`* provided to the Server.	Double-check your Client's host name: use the hostname shown in the *`CLIENT_HOST`* application console, resulting from starting the EnSight client.
	Possible networking problem.	Be sure you can `telnet` from *`CLIENT_HOST`* to *`SERVER_HOST`*. If not, consult your local system administrator for assistance.
Wrong license or license cannot be found	The `slim7.key` file is not properly installed in the `%ENSIGHT7_HOME%/license` directory	Make sure the license key(s) have been installed correctly and that all users have read permission for the file(s).

2.5 Where's the Rest?

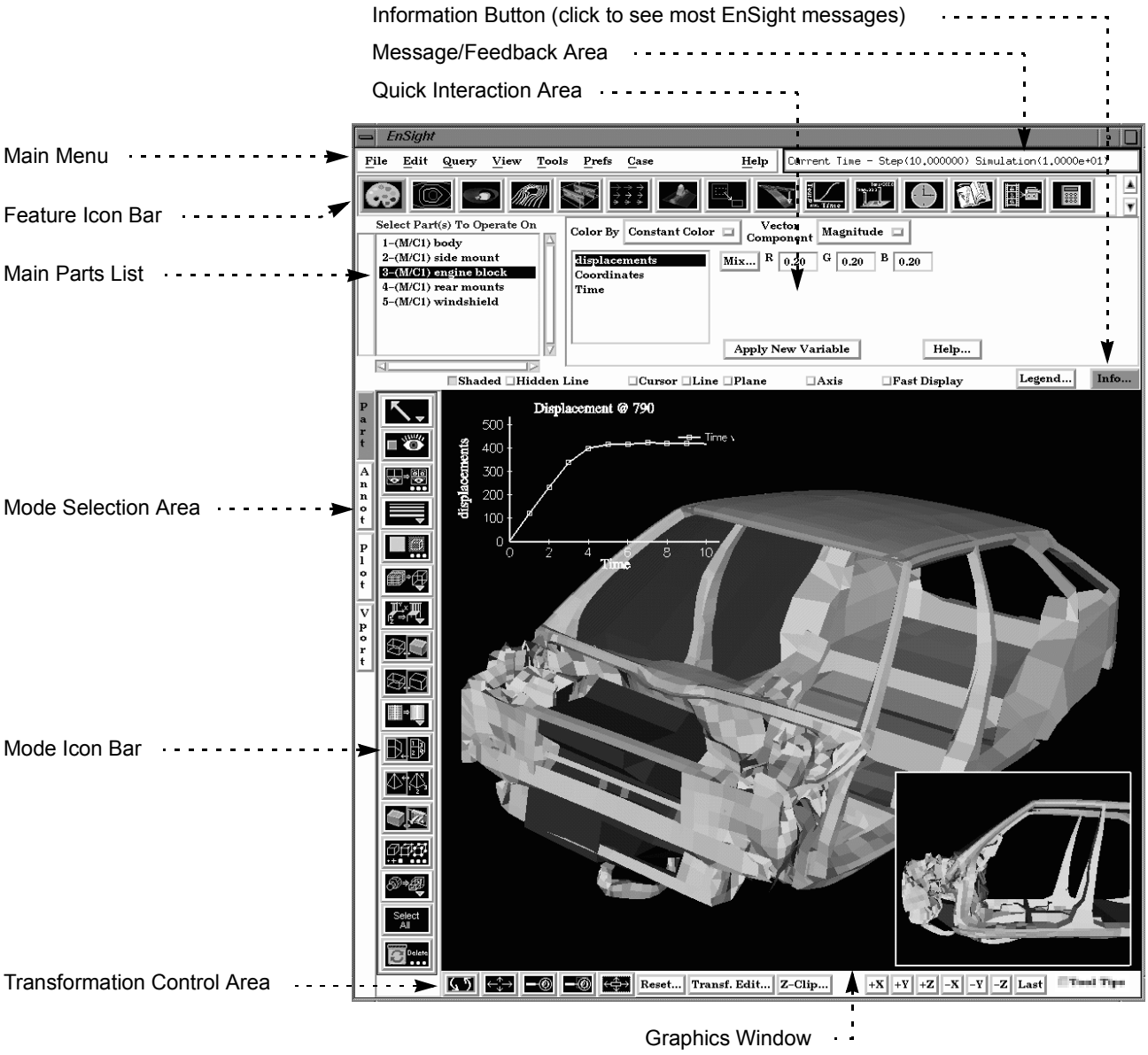
After installing EnSight, you should proceed to the next chapter, *EnSight Graphical User Interface* for an introduction to the user interface and details on how to interact with EnSight.

3 EnSight Graphical User Interface

This chapter provides a quick introduction to the EnSight Graphical User Interface. In this chapter you will explore the layout of the user interface. Conventions used in the interface (such as how to select multiple items in a list) will also be discussed.

3.1 Tour of the GUI

The major components of the EnSight user interface are shown below.



Main Menu — The Main menu provides access to basic EnSight functionality. The Help menu (at the far right end of the menu bar) contains items for accessing online help.

Message/Feedback Area — The Message area displays brief messages during various operations. Note that balloon help is available for most icons.

Information Button — Clicking the Info... button will bring up the EnSight Message Window where additional information about EnSight operations is displayed. The color of the Info... button will indicate the type of the recent entries. Green indicates normal information, yellow indicates warnings, and red indicates errors.

Main Parts List

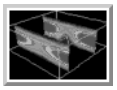
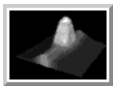
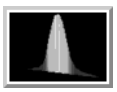
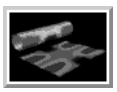
The Main Parts List displays all *parts* associated with the current session. A part is a named collection of elements (or cells) and associated nodes. All components of a part share the same set of attributes (such as color or line width).

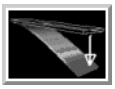
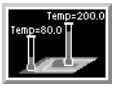
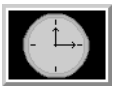
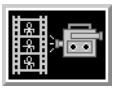
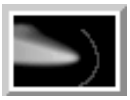
Parts are accessed via the Main Parts list. Items in the list are selected by placing the mouse pointer over the item and clicking the left mouse button. You can extend a selection by pressing the shift key as you click an item. Additional techniques for selecting parts are discussed on page 3-10.

Understanding part concepts is crucial for productive use of EnSight. See section 4.5 *Parts and Part Attributes* for more information on parts. Also see *Introduction to Part Creation* in the online documentation.

Feature Icon Bar

The Feature Icon Bar contains icons associated with the major "features" of EnSight. Clicking the left mouse button on an icon selects the feature and opens the associated interface in the Quick Interaction area. Features:

Color		Set the color of the parts selected in the Main Parts list. Parts can be colored either by a constant color or based on the value of a variable.
Contour		Create or modify a new contour (isoline) part using the part(s) selected in the Main Parts list as parents and the variable selected in the Variables list.
Isosurface		Create or modify a new isosurface part using the part(s) selected in the Main Parts list as parents and based on an isovalue of the variable selected in the Variables list.
Particle Trace		Create or modify a new particle trace part using the part(s) selected in the Main Parts list as parents and the variable selected in the Variables list as the velocity variable.
Clip		Create or modify a new clip part using the part(s) selected in the Main Parts list as parents. EnSight can create several types of clips including 1D line clips, planar clips, and quadric clips.
Vector Arrows		Create or modify a new vector arrow part using the part(s) selected in the Main Parts list as parents and the variable selected in the Variables list. Vector arrows display direction and magnitude of a vector variable.
Elevated Surface		Create or modify a new elevated surface part using the part(s) selected in the Main Parts list as parents and the variable selected in the Variables list. An elevated surface is a surface projected away from another surface with scaling based on the value of a variable.
Profile Plot		Create or modify a new profile plot part using the part(s) selected in the Main Parts list as parents and the variable selected in the Variables list. A profile plot is the 1D counterpart of an elevated surface.
Developed Surface		Create or modify a new developed surface part using the part(s) selected in the Main Parts list as parents. A developed surface is constructed by unrolling a quadric clip about its axis of revolution.

Displacement		Provides controls (in the Quick Interaction area) for specifying displacements.
Query/Plot		Provides controls for performing various query and plotting operations.
Interactive Query		Provides controls for specifying interactive queries, which display variable values as the mouse is moved over objects in the Graphics Window, as the cursor tool is moved within a volume, or at specific node, element, ijk, or xyz locations.
Solution Time		Provides controls for managing time for transient datasets.
Flipbook Animation		Provides controls for specifying Flipbook animations. Flipbook animations are on-screen animations that permit graphic transformations during playback. Flipbooks can be used to animate clipping planes and isosurfaces and are also useful for visualizing transient data
Keyframe Animation		Provides controls for specifying keyframe animations. Keyframe animation provides sophisticated motion control and output options for generating animations for either online presentation (*e.g.* MPEG) or video.
Subset Parts		Create or modify a new subset part from node and/or element label ranges of model parts.
Variable Calculator		Opens the variable calculator, for creating computed variables.
Tensor Glyph		Create or modify a tensor glyph part using the part(s) selected in the Main Parts list (as parents) and the tensor selected in the Variables list.
Vortex Cores		Create or modify a vortex core part using the part(s) selected in the Main Parts list as parents and the variable selected in the Variables list.
Shock Surfaces/ Regions		Create or modify a shock surface or region part using the part(s) selected in the Main Parts list as parents and the variable selected in the Variables list.
Separation/ Attachment Lines		Create or modify separation or attachment line parts using the part(s) selected in the Main Parts list as parents and the variable selected in the Variables list.
Boundary Layer Variables		Create or modify boundary layer variables

Quick Interaction Area

The Quick Interaction area provides the interface controls associated with the current feature selected from the Feature Icon bar. Changes in this area typically affect the

parts currently selected in the Main Parts list. For example, if the currently selected feature (selected from the Feature Icon bar) is Color, the Quick Interaction area provides controls for setting the color of the parts currently selected in the Main Parts list. If the feature is Isosurface, the Quick Interaction area provides (among other things) a numeric type-in for setting the isovalue.

Warning: If you change a text field (for example, a numeric type-in), you* must *press return to have the change take effect! This applies not only to text fields in the Quick Interaction area, but throughout the EnSight user interface.

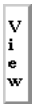
Many of the Quick Interaction areas – those associated with created parts – provide "Create" buttons. Clicking the Create button will build a new part (such as an isosurface or a clipping plane) based on current settings. Once built, the new part appears in the Main Parts list.

Some Quick Interaction areas will show a Variables list. Only variables appropriate for the selected feature will be shown in the list. A variable must be selected before the "Create" button is pressed.

Mode Selection Area

The Mode Selection Area selects the current major mode. Each mode has an associated set of icons that are loaded into the vertical Mode Icon bar when the mode is active. The six modes of EnSight are:

View



View Mode icons control various global viewing attributes. Note that many of the View Mode icons have counterparts in Part Mode – the View Mode icons act as global toggles while the Part Mode Icon applies only to the parts selected in the Main Parts list. *Note: By default, this mode is not visible. See Main Menu > Edit > Preferences... General User Interface - View Mode Allowed.*

Part

Part Mode icons control various part attributes. The operation of Part Mode icons applies *only* to the parts currently selected in the Main Parts list.

Annotation

Annotation Mode provides control over various annotation entities: text, lines/arrows, color legends, and bitmap logos.

Plot

Plot Mode provides control over the appearance and behavior of *plot entities*. A plot entity (typically created by a query operation) contains information for one or more X-Y plots. Plot entities can be positioned arbitrarily within the Graphics Window.

Viewport

Viewport Mode provides control over *viewports*. The Graphics Window can be overlaid with multiple user-defined viewports. Viewports can be sized and positioned arbitrarily and have different backgrounds and borders.

Frame

Frame Mode provides control over *frames*. A frame is a coordinate frame of reference that can be positioned independent of other frames. Parts can be attached to different frames permitting sophisticated and complex animations (*e.g.* exploding views). *Note: By default, this mode is not visible. See Main Menu > Edit > Preferences... General User Interface - Frame Mode Allowed.*

Mode Icon Bar

The Mode Icon Bar displays the icons associated with the currently selected mode. The icons are arranged in a vertical scrolling region to the left of the Graphics Window. The *Quick Icon Reference* in the online documentation provides a quick reference for all EnSight icons as well as hotlinks from the icons to relevant online articles.

Transformation Control Area

The Transformation Control Area provides icons that control various aspects of object transformations. Transformations are accomplished by selecting the action (such as rotate), moving the mouse into the Graphics Window, clicking and holding the left mouse button, and dragging the mouse to achieve the desired transformation.

The Transformation Editor (opened by clicking the Transf Edit... icon) provides precise control over all types of transformations.

The possible actions are:

Rotate

Rotate: click and drag
- left-right to rotate about the vertical axis
- up-down to rotate about the horizontal axis
- left-right with the control key pressed to rotate about the screen Z axis.

Translate

Translate: click and drag
- left-right to translate in the horizontal direction
- up-down to translate in the vertical direction
- left-right with the control key pressed to translate in Z.

Zoom

Zoom: click and drag
- up/right to zoom out or down/left to zoom in
- with control key pressed to pan

Zoom is implemented by moving the virtual camera.

Band Zoom

Rubber-band zoom: click and hold the left mouse button on one corner of the desired viewing region, drag to opposite corner. An outline of the region will appear as you drag. Release the mouse button to zoom to the outlined region.

Scale

Scaling is only handled via the Transformation Editor.

Reset Tools and Viewports

Open the Reset Tools and Viewports dialog that permits easy resetting of all or some transformation operations.

Transformation Editor		Open the Transformation Editor dialog.
Z-Clip Editor		Open the Transformation Editor dialog in Z-Clip mode.

Graphics Window All 3D objects, as well as annotation entities, are displayed in the Graphics Window. The Graphics Window can contain additional (up to fifteen) user-defined viewports as well as X-Y plots.

3.2 User Interface Conventions

The EnSight user interface uses standard menus, dialogs, buttons, and other interface components (for Unix the OSF/Motif toolkit is used). This section provides information on these components as well as instructions for interaction.

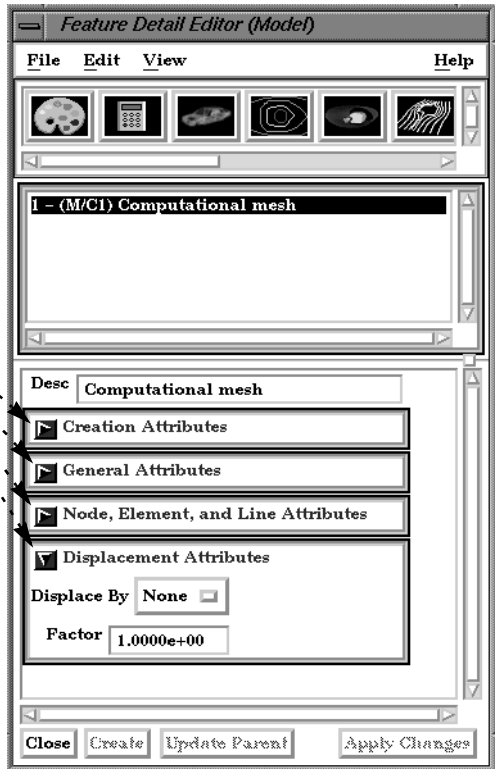
Dialog Windows

A dialog is a window that groups interface components based on function. Dialogs are typically opened by making selections from a menu or clicking an icon. Menu selections and icons that open dialogs always end with "...". Most EnSight dialogs can be opened and closed independently. In order to optimize scarce workstation screen real estate, you should close dialogs that are not in use. The default position of each dialog was chosen to best use the space available. You can, however, move the dialogs using your window manager and then save the positions for subsequent sessions (select Save Size and Position of Main Windows from the Edit > Preferences... General User Interface dialog).

Dialogs typically consist of buttons, menus, lists, and areas to type in. Some EnSight dialogs also have expandable sections that let you hide parts of the interface that you use infrequently. Each expandable section consists of an indicator button, a section title, and the contents of the section. The indicator button and the section title are always visible. If the section is open, the contents are visible as well.

The indicator button is a toggle switch for opening and closing the section. For Unix, a right-pointing arrow indicates a closed section. Clicking the arrow will open the section. A down pointing arrow indicates an open section. Clicking the arrow will close the section. These indicators are referred to as *turndown buttons*.

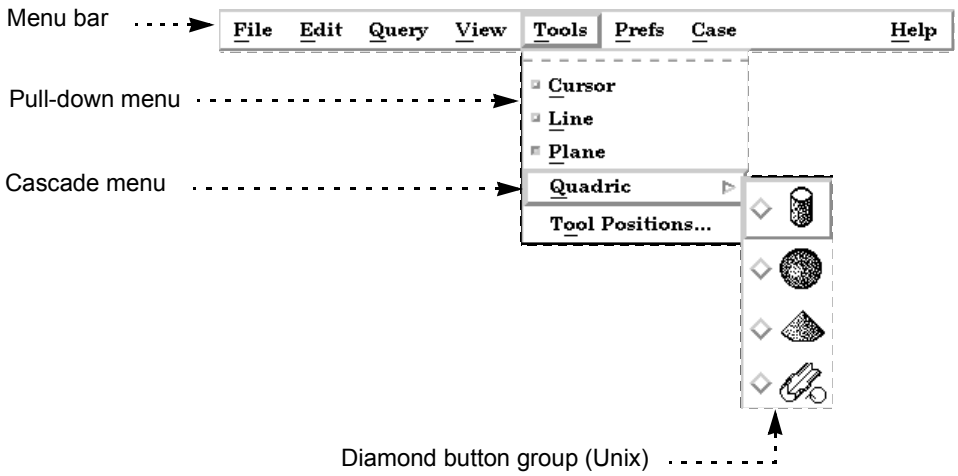
(Note: For Windows NT, a regular toggle button is used.)



Menus

The EnSight documentation uses the following terms to describe various types of menus:

Menu bar	A horizontal strip across the top of a dialog listing menu titles.
Pull-down menu	A pull-down menu is one accessed directly from a menu bar.
Cascade menu or submenu	A submenu is accessed from another menu selection. Submenu selections are indicated by a right-pointing arrow.
Options menu or pop-up menu	An options menu is accessed by pressing the associated button. The current selection always appears as the button title.



Lists

Lists (such as the Main Parts list) are presented in dialogs as scrollable sections. Various mechanisms are used to select items from a list for further action:

To...	Do This...	Details...
Select an item	Single-click	Place the mouse pointer over the item and click the left mouse button. The item is highlighted to reflect the "selected" state.
Extend a contiguous selection	Select-drag	Place the mouse pointer over the first item. Click and hold the left mouse button as you drag over the remaining items to be selected. Only contiguous items may be selected in this fashion.
Extend a (possibly long) contiguous selection	Shift-click	Place the mouse pointer over the item. Press the shift key and click the left mouse button. This action will extend a selection to include all those items sequentially listed between the previous selection and this one.
Extend a non-contiguous selection	Control-click	Place the mouse pointer over the item. Press the control key and click the left mouse button. This action will extend a selection by adding the new item, but not those in-between any previously selected items.
De-select an item	Control-click	Place the mouse pointer over the selected item. Press the control key and click the left mouse button. This action will de-select the item.

You can also double-click list items. The result depends on the list and type of item. For model parts in the Main Parts list, a double-click will open the Color Quick Interaction area. For created parts, the Quick Interaction area for the corresponding part type will open. Double-clicking variables in the Main Variables list will open the Feature Detail Editor for Variables with the clicked variable already selected. To double-click, place the mouse pointer over the item and click the left mouse button twice in rapid succession.

Buttons

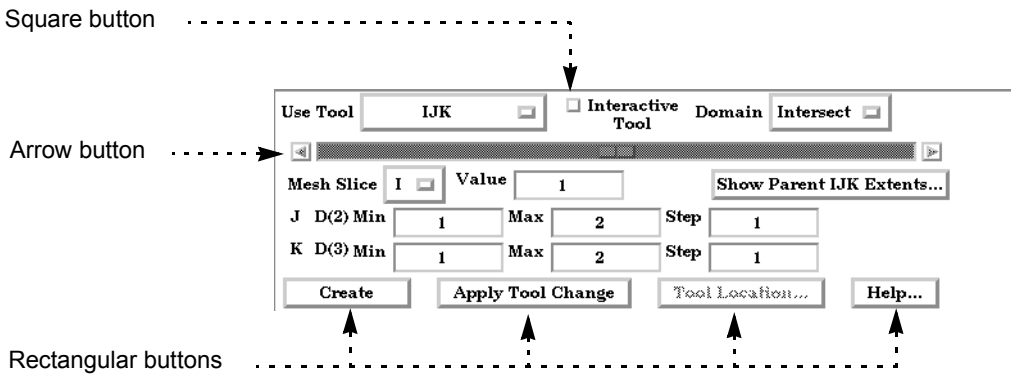
EnSight uses the following kinds of buttons:

Rectangular Place the mouse cursor in the button area and click the left mouse button. Rectangular buttons typically access the function described in the label. If the label is followed by "..." then the button opens another dialog.

Arrow Place the mouse cursor in the button area and click the left mouse button. Arrow buttons typically have an associated text field or scroll bar. Clicking the button increments or decrements the text field or scroll bar value.

Diamond Place the mouse cursor in the button area and click the left mouse button. Diamond buttons (also called radio buttons) are toggles that select an item from a mutually exclusive list. Exactly one diamond button of a group can be on at any given time. Note that for the NT Version no diamond buttons are used, but that the selection of items works as described here.

Square Place the mouse cursor in the button area and click the left mouse button. Square buttons are toggles that access the function indicated by the label.



Text Fields

EnSight utilizes two types of text fields:

Information Text Fields

These text fields are used to report information and cannot be edited by the user. Information text fields are surrounded with a single pixel border

Editable Text Fields

Place the mouse cursor in the text field and click to insert a blinking insertion cursor. Several techniques are available to accelerate text editing. Select a single word by double-clicking or the entire string by triple-clicking. Selected text is replaced by subsequent typing. The left and right arrow keys (on most systems) will move the insertion cursor.

Note: *You* must *type return (while the blinking insertion cursor is still in the field) for changes to text fields to take effect!*

Where appropriate (*i.e.* in File Selection dialogs), EnSight recognizes the following shortcut specifications for UNIX directories:

`~/`	Expands to your home directory.
`~username/`	Expands to the home directory of `username`.
`./`	Expands to the current working directory.
`../`	Expands to the parent directory of the current working directory

(For NT systems, one should use a \ (backslash) in place of the / (forward slash)).

Note that standard wildcard characters (*e.g.* `*` to represent a series of zero or more arbitrary characters) can also be used in File Selection dialogs.

3.3 Where's the Rest?

Once you are familiar with the EnSight user interface, proceed to the next chapter, *Simple Demonstration*.

Several online articles provide overview and reference information. See the *EnSight Overview* (Help > EnSight Overview...) and the *Quick Icon Reference* (Help > Quick Icon Reference...).

For additional overview information, see Chapter 1 of the User Manual. Chapter 5 of the User Manual also contains an overview of the user interface.

4 Simple Demonstration

This chapter provides a step-by-step demonstration of basic EnSight operation. After successfully completing this chapter, you should be able to:

- start EnSight (including the Client-Server connection),
- read a dataset and load a model,
- transform objects in the Graphics Window: rotate, translate, and zoom,
- reset transformations,
- create and manipulate additional viewports,
- work with parts and change part attributes,
- access the online documentation,
- exit EnSight.

4.1 Starting EnSight

If you successfully performed the installation verification as described in *Verifying the Installation* on page 1-15, you have already started EnSight and connected the Client and Server. The same operation will be performed here.

To start EnSight, execute the following instructions for your particular installation type (stand-alone or distributed).

Starting EnSight for Stand-alone Use

If your installation of EnSight is stand-alone (*i.e.* the Client and Server are both running on the same workstation), you can use these simplified steps to start EnSight and *auto-connect* the Client and Server processes.

For Unix Systems:

You should be logged into the console of the workstation on which the EnSight Client and Server have been installed. In addition, the `ENSIGHT7_HOME` and other ENSIGHT7 environment variables, as well as your command search path must be set up correctly as described on page 1-8.

1. Change to the directory containing the simple frame dataset. (The dataset contained in this directory will be loaded into EnSight in section 4.2.)

   ```
   % cd $ENSIGHT7_HOME/data/frame
   ```

2. Start EnSight using the `ensight7` shell script:

   ```
   % ensight7
   ```

For NT Systems:

1. Choose EnSight7 from the Start > Programs menu.

This will automatically start the Client and the Server and make the connection. If you click on the Info... button on the Desktop, you should see “Connection accepted” in the EnSight Message Window dialog. Licensing information (licensee and expiration date) should also appear in the lower left corner of the Graphics Window. You should now proceed to the next section.

If the connection failed, please consult *Troubleshooting the Connection* on page 1-17 before contacting CEI support.

Starting EnSight for Distributed Use

If your installation of EnSight is distributed (*i.e.* the Client and Server are running on different computer systems), use the steps given below to start EnSight. Note that this operation is a *manual connection*. EnSight can be set up to perform the connection automatically. See *How To Connect Automatically* in the online documentation for details.

In the instructions that follow, *`CLIENT_HOST`* refers to the system on which the EnSight Client was installed and *`SERVER_HOST`* refers to the system on which the EnSight Server was installed.

The instructions also assume that the ENSIGHT7 environment variables as well as the command search path have been set up correctly as described on page 1-8.

For UNIX Systems:

1. Log on to the console of *CLIENT_HOST* and open at least two shell windows. Since the EnSight user interface will open on the right side of your screen, place the two shell windows on the left side.
2. In the first shell window, start the EnSight Client:

   ```
   % ensight7.client -cm
   ```

   The -cm option tells the Client to begin listening for a connection from the Server. The EnSight Client user interface should appear on your workstation screen.
3. In the second shell window on your workstation, log on to *SERVER_HOST*:

   ```
   % telnet SERVER_HOST
   ```

4. In the second shell window, change to the directory containing the simple frame dataset. (The dataset contained in this directory will be loaded into EnSight in section 4.2.)

   ```
   % cd $ENSIGHT7_HOME/data/frame
   ```

5. In the second shell window, start the EnSight Server:

   ```
   % ensight7.server -c CLIENT_HOST
   ```

   The -c *CLIENT_HOST* option tells the EnSight Server to connect to the EnSight Client listening on *CLIENT_HOST.*

For NT Systems:

1. Log on to the *CLIENT_HOST*. Double click the ens7cl.exe icon located in the *INSTALL_DIRECTORY*\machines\win32 folder.
2. Bring the Connection dialog up, by File > Connect Server...
3. Change the “Type” to “Manual”.
4. Click the “Connect Server” button.
5. If the *SERVER_HOST* is a UNIX machine, follow steps 3 through 5 in the “For UNIX Systems” above. If the *SERVER_HOST* is a NT machine, continue with these instructions.

   Log on to the *SERVER_HOST*. Double click (or run, if you telnet in to the machine) the ens7sv.exe icon located in the *INSTALL_DIRECTORY*\machines\win32 folder.
6. In the resulting application console window, enter the name of the *CLIENT_HOST* machine.

The Server should make the connection. If the connection is successful, you should see “Connection accepted” in the Status History area (just below the upper right corner of the EnSight window). Licensing information (licensee and expiration date) should also appear in the lower left corner of the Graphics Window.

If the connection failed, please consult *Troubleshooting the Connection* on page 1-17 before contacting CEI support.

Distributed Use - Automatic Connection

You can perform an *automatic connection* where the Server starts automatically and connects to the Client, even though the two processes are on different host systems. This type of connection requires some initial setup and is not discussed in the *Getting Started* manual. However, once configured, the automatic connection lets you start a session in a single step.

See *How To Connect Automatically* in the online documentation for details.

(For information on the online help facility, see *Using Online Help* on page 4-20.)

4.2 Reading a Dataset

After starting EnSight, the next step in any session is to read a dataset and load the parts. To read a dataset, the relevant files and data format must be specified. EnSight supports several formats common in the computational analysis field. In addition, EnSight also supports native formats suitable for storing both block structured and unstructured (*i.e.* finite-element) geometry. In this example, we will load an EnSight format file.

After you have successfully started EnSight (as detailed in the previous section), you are ready to read a dataset.

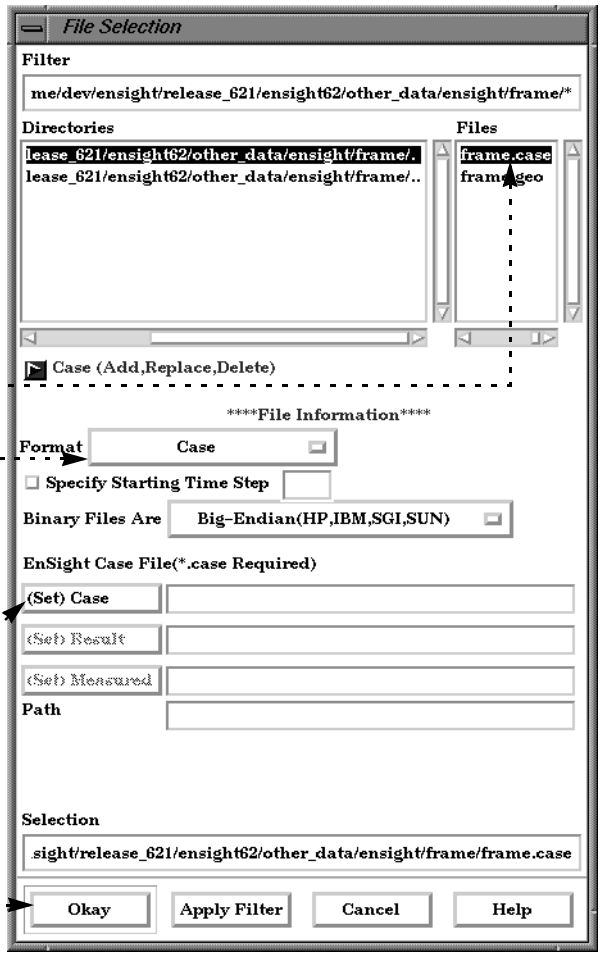
1. Select File > Data (Reader)... from the EnSight Main menu.

For EnSight to properly read data, it must know both the file name and format. In this example, we will load a simple geometry that requires only a single data file – the geometry file. Many datasets require the specification of at least one other file that contains results (variable) information.

For UNIX: Since we initially started EnSight (in the previous section) from the desired directory (`$ENSIGHT7_HOME/data/frame`), this directory is opened automatically (as seen in the Directories list).

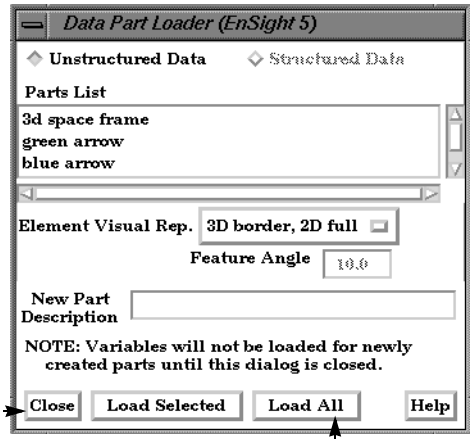
For NT: You will be in the machines\win32 directory. You need to go up two levels by twice double clicking on the .. directory, then go down to `data`, then the `frame` directory.

2. Click `frame.case` in the Files list.
3. Be sure the Format is set to Case (it is by default).
4. Click (Set) Case to set the casefile to the file currently selected in the Files list (*i.e.* `frame.case`).
5. Click Okay to accept the selections and close the dialog window.



See *How To Read Data* in the online documentation for more information on data reading.

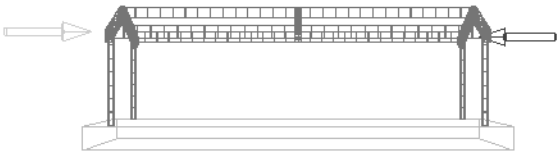
When the File Selection dialog is closed, EnSight reads the file and opens the Data Part Loader dialog. During the initial read, EnSight determines the individual parts available in the file. You can choose to load all the parts, or only a subset. You can also pick an initial visual representation for each part individually (more on this later).



6. Click Load All. This will load the parts into EnSight and display them in the Main Parts list.

7. Click Close.

The four constituent parts are now listed in the Main Parts list and displayed in the Graphics Window:



Note: *To improve the legibility of the* Getting Started *manual, all images of the Graphics Window are shown with a white background rather than the default black background that EnSight uses.*

See *How To Read EnSight 7 Data* in the online documentation for more information on the Data Part Loader dialog. There is a *How To Read <format> Data* for each supported format.

Getting Your Data Into EnSight

EnSight supports a number of common data formats as well as interfaces to various simulation packages. There are four different means to get your data into EnSight.

Type 1 - Direct (built-in) Readers - Are accessed by choosing the desired format in the Data Reader dialog. These include common data formats as well as a number of readers for commercial software.

Type 2 - User-Defined readers - A library of routines is provided with EnSight to allow users to create their own custom interfaces. Like Type 1, User-Defined Readers have the advantage of not requiring a separate data translation step and thus reduce user effort and disk storage requirements. A number of User-Defined Readers are provided with EnSight; complete documentation and dummy routines may be found in the directory $ENSIGHT7_HOME/user_defined_src/readers.

Type 3 - Stand - Alone Translators - May be written by the user to convert data into EnSight format files. A complete description of EnSight formats may be found in Chapter 11 of the EnSight Online User Manual. The suggested format to use is the "EnSight Case Gold" format. Several translators are provided with EnSight. These are found in the directory $ENSIGHT7_HOME/translators. Translators must first be compiled before they may be used. Some require links to libraries provided by the vendor of the program in question. See the README files found in each translator's directory.

Type 4 - EnSight Formats - A growing number of software suppliers support the EnSight formats directly, i.e. an option is provided in their products to output data in one of the EnSight formats.

The table that follows summarizes all of the data formats and software packages for which an interface of Type 1-4 exists. As this information changes frequently, please consult your EnSight support representative should you have any questions. If your format or program is not listed here, there is the possibility that an interface does indeed exist. Contact EnSight support for assistance. Should you create a User-Defined Reader or Stand - Alone Translator and wish to allow its distribution with EnSight, please send an email to this effect to ensight_support@ceintl.com.

Data Format / Program	Type	Comments
ABAQUS	1	Direct reader for binary or ascii .fil files
ACUSOLVE	2	Contact vendor for details
ADINA	3	Use I-DEAS neutral files and translators
ANSYS	1	Direct reader for binary .rst, .rth, .rmq, .rfl files
CASE (EnSight6/EnSight Gold)	1	Native EnSight formats, Ensight6 Case or EnSight Gold Case
CFD++	4	Exports EnSight Case format
CFD-ACE	2	Contact vendor for DTF reader
CFD-FASTRAN	2	Contact vendor for DTF reader
CFDESIGN	2	Uses Tecplot files and reader
CFF	2	User reader for Common File Format (WIND code)
CFX4	2	User reader
CFX5	4	Code exports EnSight Case format
CFX-TASCflow	3	Converts TASCflow output to EnSight format
CGNS	3	User reader
COBALT	2	User reader (obtain from www.cobaltcfd.com)

Data Format / Program	Type	Comments
CRAFT	4	Exports EnSight Case format
CRUNCH	4	Exports EnSight Case format
CTH	4	CTH exports EnSight format files
ENSIGHT5	1	Original EnSight format (unstructured)
ESTET	1	Direct reader for the EDF code ESTET
EXODUS II	2	User reader
FAST Unstructured	1	Direct reader for NASA FAST unstructured format
FEFLO	3	Contact vendor for details
FENSAP	4	Contact vendor for details
FIDAP	1	Direct reader for FIDAP neutral (FDNEUT) files
FINE/Aero	1, 2	Use PLOT3D or CGNS files/reader
FINE/Turbo	1, 2	Use PLOT3D or CGNS files/reader
FIRE	4	Code exports EnSight format
FLOW-3D	2	User reader for FLOW-3D results (flsgrf) files
FLUENT (particle files)	3	Converts Fluent particle file to EnSight format
FLUENT	4	Code exports EnSight Case format
GASP	4	Exports EnSight Case format
GUST	4	Exports EnSight Case format
HDF	2	Contact CEI for reader
I-DEAS	3	Translator for I-DEAS FEA neutral file
KIVA	2, 3	Conversion routines to export EnSight format, contact CEI for information
LS-DYNA	2	User reader for d3plot files
MAYA ESC	4	Contact vendor for details
MOVIE.BYU	1	Direct reader for MOVIE.BYU format files
MPGS 4.1	1	Direct reader for MPGS, EnSight's predecessor
MSC.DYTRAN	2	User reader for MSC/Dytran archive (.arc) files
MSC.NASTRAN	2	User reader for binary OP2 files.
N3S	1	Direct reader for the EDF code N3S
PATRAN	3	Converts PATRAN neutral files to MOVIE.BYU format
PHOENICS	1	Use PLOT3D files/reader
PLOT3D	1	Direct reader for PLOT3D and FAST structured formats
POLY-3D	3	Contact vendor for details
POLYFLOW	1	Read as FIDAP neutral files, FDNEUT
POWERFLOW	3	Contact EXA for information on interfaces available
PXI	2	User reader for Parallel Exodus Interface format
RAD THERM	4	Contact vendor for details
SCRYU	2	User reader
SILO	2,3	Reads various formats supported by SILO API
SPHINX	4	Code exports EnSight format
STAR-CD (Version 3.0.5 and up)	4	Code exports EnSight Casefile format. (including particle data)
STL	2	User reader for STL geometry files
TECPLOT	2	User reader for TECPLOT structured and unstructured formats
VECTIS	2, 3	Contact vendor, Ricardo, for information

4.3 Performing Transformations

It's easy to rotate, translate, and zoom the geometry displayed in the Graphics Window. The basic operation is:

- Select the desired transformation operation in the Transformation Control area (*e.g.* Rotate).
- Move the mouse pointer into the Graphics Window.
- Click and hold the left mouse button and drag to achieve the desired transformation.

.

Rotate using the mouse:

1. Select Rotate in the Transformation Control area. 
2. Move the mouse pointer into the Graphics Window.
3. Click and hold the left mouse button and drag the mouse left and right. The model rotates about the vertical (Y) axis.
4. Drag the mouse up and down. The model rotates about the horizontal (X) axis.
5. Hold down the control key and move the mouse left and right. The model rotates about the Z axis.

Translate using the mouse:

6. Select Translate in the Transformation Control area. 
7. Move the mouse pointer into the Graphics Window.
8. Click and hold the left mouse button and drag the mouse left and right. The model translates horizontally.
9. Drag the mouse up and down. The model translates vertically.
10. Hold down the control key and move the mouse left and right. The model translates in and out along the Z axis.

Zoom using the mouse:

11. Select Zoom in the Transformation Control area. 
12. Move the mouse pointer into the Graphics Window.
13. Click and hold the left mouse button and drag the mouse up or to the right. The model zooms out.
14. Drag the mouse down or to the left. The model zooms in.
15. Hold down the control key and move the mouse. The model pans.

Note that the zoom operation actually moves the virtual camera rather than moving the geometry.

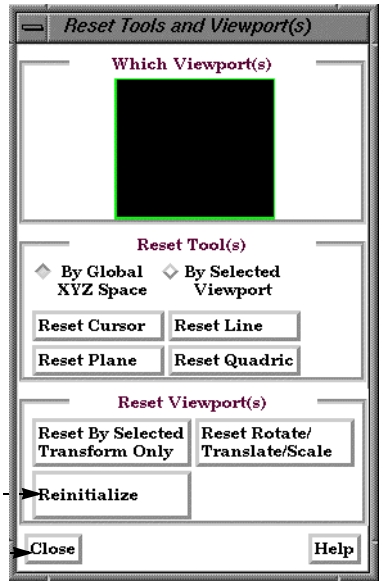
Note: *By default EnSight ships with the left mouse button defined to do Transformation Actions as just described, the middle button defined to do Translations directly, and the right mouse button defined to do Zoom operations directly.* The assignment of operations to mouse buttons can be customized by the user.

See *How To Rotate, Zoom, Translate, Scale* in the online documentation for more information on model transformations.

At this point, you have probably transformed the model into a strange orientation. You can easily reset the view to the default position and orientation.

16. Click Reset... in the Transformation Control area. This opens the Reset Tools and Viewport(s) dialog.

You can use this dialog to clear the selected transform operator only (*i.e.* the one currently selected in the Transformation Control area), all rotate, translate, scale transforms (but not zoom), or to "reinitialize" the entire view. Reinitialize will not only clear all transformations, it will also reposition the virtual camera such that all currently visible parts are scaled to fit the Graphics Window.



17. Click Reinitialize.
18. Click Close.

See *How To Reset Tools and Viewports* in the online documentation for more information on resetting transformations.

You can also perform precise transformations (such as rotating 22.5 degrees about the X axis) using the Transformation Editor.

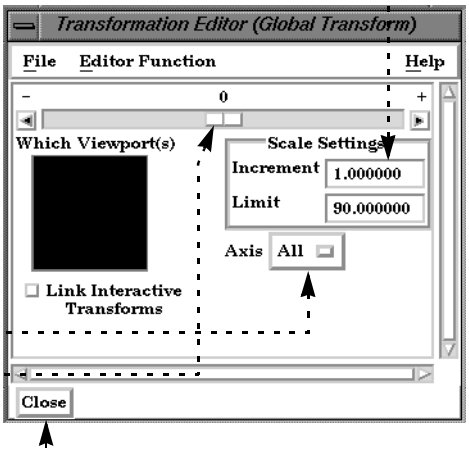
19. Click Transf Edit... in the Transformation Control area. This opens the Transformation Editor dialog in Global Transform mode.

In this mode, changes to the Transformation Editor apply *only* to the currently selected action in the Transformation Control area (*e.g.* rotate or translate).

20. Select Rotate in the Transformation Control area.
21. Click the Axis pop-up menu and select X.
22. Place the mouse pointer in the Increment field and double-click the left mouse button to select the entire value "1.000000".
23. Enter the value "22.5" and press return.

The model is rotated precisely 22.5 degrees about the X axis.

24. Grab the slider (click and hold the left mouse button) and drag left and right. Note that the actual number of degrees rotated is printed above the slider thumb switch as it is moved.



Experiment with the Transformation Editor – set Axis to other values or change the current action in the Transformation Control area to edit translation or scale.

When you are done:

25. Click Close.
26. Reinitialize all transformations as described in steps 16-18 above.

EnSight Hot Keys

EnSight makes use of certain keyboard keys to simplify common operations. A quick reference is shown below.

F1 - Rotate 45 degrees about x-axis (hold Control key down for -45 degree rotations) | (**If in**
F2 - Rotate 45 degrees about y-axis (hold Control key down for -45 degree rotations) | **rotate**
F3 - Rotate 45 degrees about z-axis (hold Control key down for -45 degree rotations) | **mode**)
F4 - Toggle on/off spin mode
F5 - Show standard right view (Look down the x-axis)
F6 - Show standard top view (Look down the y-axis)
F7 - Show standard front view (Look down the z-axis)
F8 - Return scene to view prior to F5, F6, or F7
(hold Control key down while pressing F5, F6, F7 will store current view to selected Fx key)
F9 - Toggle on/off full screen mode
F10 - Decrease stereo separation angle |
F11 - Increase stereo separation angle | **(If hardware supports stereo)**
F12 - Toggle on/off stereo display |
P key - Used for picking operations
A key - Abort keyframe animation
Control key - When held during rotates or translates, model rotates/translates about z-axis

For more information, see the online help "HowTo" sections:

F1, F2, F3, F4, F5, F6, F7, F8, F9 - *How To Rotate. Zoom, Translate*.

F10, F11, F12 - *How To Enable Stereo Viewing*.

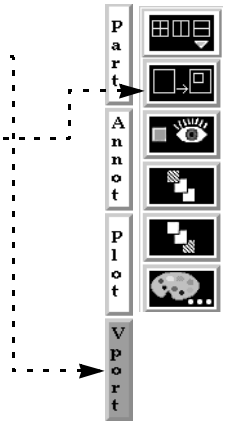
The user may also assign EnSight commands or macros to any keyboard or mouse key. See *How To Define and Use Macros* for more information.

4.4 Creating and Manipulating Viewports

In addition to the default viewport (which takes up the entire Graphics Window and cannot be changed), EnSight provides up to fifteen additional user-defined viewports. These viewports can be sized and positioned arbitrarily and can have different border and background attributes. By default, each viewport displays all parts that are currently visible. You can, however, have viewports that display only a subset of the visible parts.

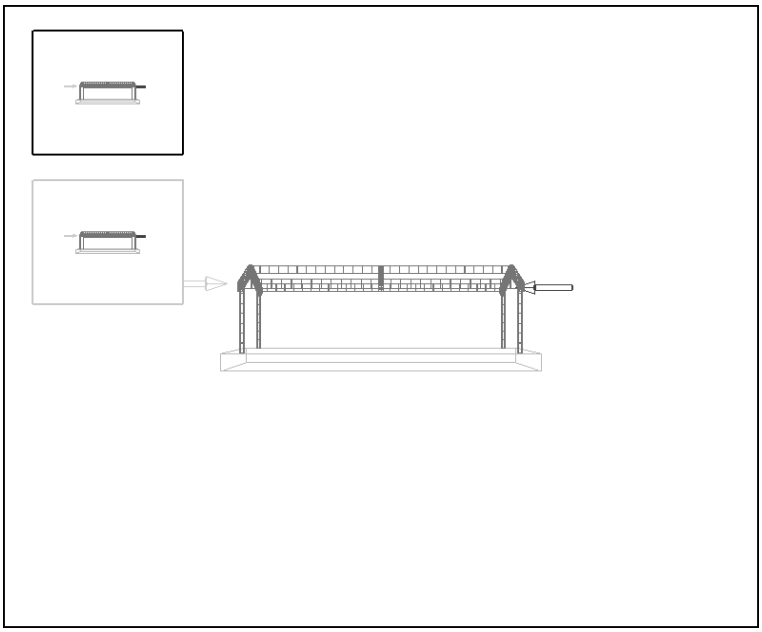
To create new viewports:

1. Click VPort in the Mode Selection area to enter Viewport mode.
2. Click the New Viewport icon to create a new viewport.
3. Click the New Viewport icon again to create another new viewport.



Your Graphics Window should look like the following. New viewports initially appear in columns starting from the top left corner. Note that the second viewport created has a light green border: this viewport is the *currently selected viewport*. Viewport operations (such as setting a border) operate only on the currently selected viewport(s). To select a viewport:

4. Move the mouse pointer into the Graphics Window and within the bounds of the first new viewport (the upper one with a white border).
5. Click the left mouse button to select the viewport.



You can easily resize or reposition a viewport. To reposition a viewport:

6. Place the mouse pointer within the bounds (but not too close to an edge) of the selected viewport. The mouse cursor should be an arrow.
7. Click and hold the left mouse button and drag the viewport to the desired location.

To resize a viewport:

8. Place the mouse pointer within the bounds of the selected viewport. Move the pointer towards one of the corners until the cursor changes to an arrow and right-angle.
9. Click and hold the left mouse button and drag the viewport corner to the desired location.

You can also move a single viewport edge by positioning the pointer over an edge, clicking, and dragging. Experiment with resizing and repositioning the viewports.

Viewport mode is exclusively for changing the properties of viewports. You cannot work with parts or rotate objects while in Viewport mode. To return to normal operation, change the mode from Viewport to Part.

10. Click Part in the Mode Selection area to enter Part mode.
11. Click Rotate in the Transformation Control area.
12. Move the mouse into the Graphics Window and into one of the new viewports you created. Note that the selected viewport is no longer highlighted with the light green border.
13. Click the left mouse button and drag to rotate the objects in the viewport.

The other viewports are unchanged – each viewport maintains its own set of transformations.

User-defined viewports can easily be deleted when they are no longer required:

14. Click VPort in the Mode Selection area to enter Viewport mode.
15. Move the mouse pointer into the Graphics Window and within the bounds of one of the two viewports you created. Click to select the viewport.
16. Click the Delete icon (or hit the “Del” key on the keyboard while the mouse is in the graphics window) to remove the viewport.

You will be asked to confirm the deletion.

17. Delete the second viewport you created as well.

See *How To Define and Change Viewports* in the online documentation for more information.

4.5 Parts and Part Attributes

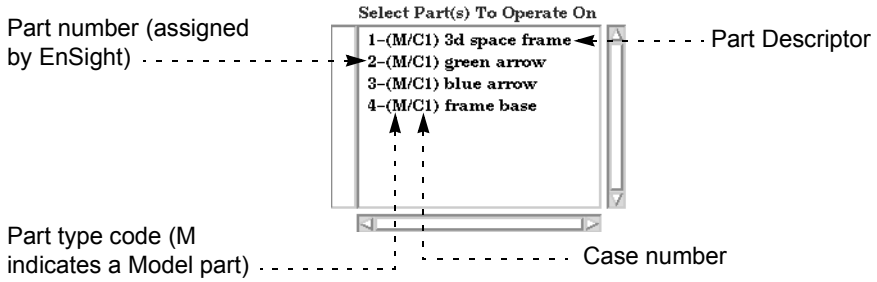
Since virtually every task you perform in EnSight involves some form of part manipulation, it is vital to understand how parts work.

Parts are either built during the loading process (based on your computational mesh and associated surfaces) or created during an EnSight session. Parts created during loading are called *model parts*. Model parts can also be created during an EnSight session by performing geometric operations (such as a copy) on other model parts.

All other parts are created during an EnSight session and are called *created* or *derived* parts. Created parts are built using one or more other parts as the *parent parts*. The created parts are said to *depend on* the parent parts. If one or more of the parent parts change, all parts depending on those parent parts are automatically recalculated and redisplayed to reflect the change. Examples of created parts include clipping planes, isosurfaces, isocontours, and particle traces.

Only model parts will be used in this section. The next two chapters will work with created parts.

The Main Parts list provides access to all parts. Each part is listed individually in a scrollable list. Each entry provides a part descriptor (name) and three additional pieces of information:



EnSight provides a large number of *attributes* that can be edited on a per-part basis. Attributes control the appearance or behavior of parts. Examples include visibility, color, line width, and transparency. Part attributes are typically edited in Part Mode. Some part attributes controlled through Part Mode icons also have a counterpart in a View Mode icon that acts as a global toggle for the attribute. For example, View Mode has an icon for hidden surface that enables/disables shaded surface display for all parts. Part Mode has a hidden surface icon that enables/disables shaded surface display on a per-part basis.

Many operations in EnSight (such as setting attributes) require that the parts to be acted on are selected (highlighted) prior to the operation. Items in the Main Parts list are selected by placing the mouse pointer over the item and clicking the left mouse button. You can extend a selection by pressing the shift key as you click an item. Additional techniques for selecting items in lists are discussed on page 3-10.

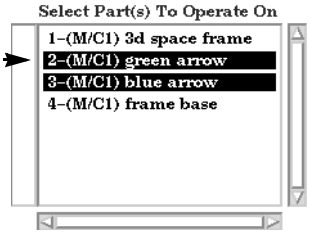
In the remainder of this section, we will explore parts and changing part attributes.

The last operation performed was to delete the two viewports we had created. If necessary, reset the transformations to return to the default view (as described on page 4-10).

The first task is to enable hidden surface (shaded) display. By default, the part-specific shaded attribute (as set in Part Mode) is on. By toggling on the corresponding Shaded toggle on the Desktop, we enable hidden surface display for all parts.

1. Click the Shaded Toggle on the Desktop to enable shaded surface display for all parts.

All objects in the Graphics Window are now displayed with shaded surfaces rather than the default wireframe. We can now selectively disable shaded display for individual parts.

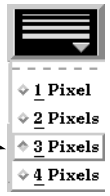


2. Select the “green arrow” and “blue arrow” parts in the Main Parts list: place the mouse pointer over the green arrow part, click the left mouse button, and drag down until both parts are highlighted.
3. Click Part in the Mode Selection area to enter Part mode.
4. Click the Part Shaded Toggle to disable shaded surface display for the selected parts (you may have to scroll the vertical Mode Icon bar to reveal the icon).

Note that the Part Shaded Toggle icon changes (the wireframe side is now highlighted) to reflect the fact that the selected parts have shaded disabled.

Let’s change the line width of the selected parts:

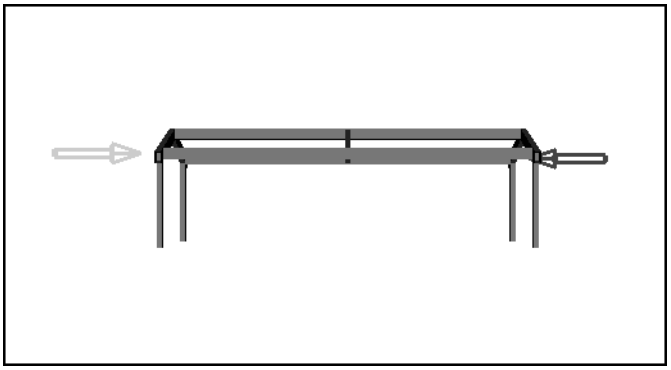
5. Click the Part Line Width pulldown and select 3 Pixels from the menu.



Note that the line width of the selected parts (the arrows) has increased.

6. Select the “frame base” part in the Main Parts list.
7. Click the Part Visibility Toggle to disable display of the part.

After these operations, the geometry in your Graphics Display should look like the following.



Parts are assigned a default color when loaded into EnSight. These colors are *constant*, meaning that every portion of the part is colored the same. Parts can also be colored by a variable value. Since the value associated with a variable typically varies from node to node, the displayed color will vary across the surface of the part.

To change part colors:

8. Select all the parts in the Main Parts list: choose Edit > Part > Select All.
9. Click the Color icon in the Feature Icon bar.

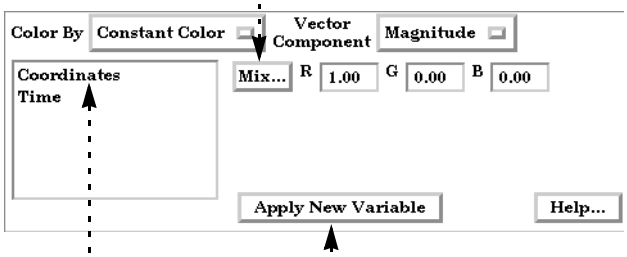
The Quick Interaction area for color opens. Note that the Color by menu is set to Constant Color.

10. Click the Mix... button to open the Color Selector dialog.
11. Pick a shade of gray from the bottom row of the color palette and click Apply at the bottom of the dialog.
12. Click Close to close the Color Selector dialog.

Note that all parts in the Graphics Window are now colored by the same shade of gray.

Although this dataset has no associated variable data, we can still color the parts by a variable since EnSight provides some defaults: Coordinates and Time. The Coordinates variable treats the XYZ coordinate of a node as a vector; color is assigned based on the magnitude of that vector.

13. Select (single-click) Coordinates in the Variables list.
14. In the Quick Interaction area, click Apply New Variable.



Note the color change. The left rear post of the frame is closest to the origin of the coordinate system and is colored blue.

See *How To Change Color* in the online documentation for more information.

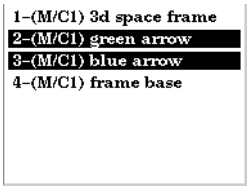
Up to this point, all parts have been selected by clicking in the Main Parts list. You can also select parts by picking them in the Graphics Window. Although this dataset contains only four parts, most geometries contain many more and selecting parts via the list can become tedious. To select parts by picking:

15. Move the mouse into the Graphics Window and place the pointer over the arrow on the left side of the model.
16. Press (and release) the 'p' key on the keyboard.

Look at the Main Parts list: the "green arrow" part (number 2) should now be the only part selected. (If this is not the case, be sure the mouse pointer is directly over one of the lines of the part and press the 'p' key again.)

17. Move the mouse pointer over the arrow on the right side of the model.
18. Press and hold the control key. With the control key still down, press and release the 'p' key.

Holding down the control key during the pick *extends* the current selection: both the "green arrow" and the "blue arrow" parts should now be selected in the Main Parts list. See *How To Select Parts* in the online documentation for more information.



If a dataset contains many parts, it can be difficult to determine which parts in the Graphics Window correspond to the parts selected in the Main Parts list. To display selected parts only:

19. Select View > Show Selected Part(s)... from the Main menu.

This opens a new graphics window (titled Selected Part(s) Window) that displays only the arrow parts.

20. Select View > Show Selected Part(s)... again to remove the window.
21. Click the Part Shaded Toggle to enable shaded surface display for the selected parts (you may have to scroll the vertical Mode Icon bar to reveal the icon).

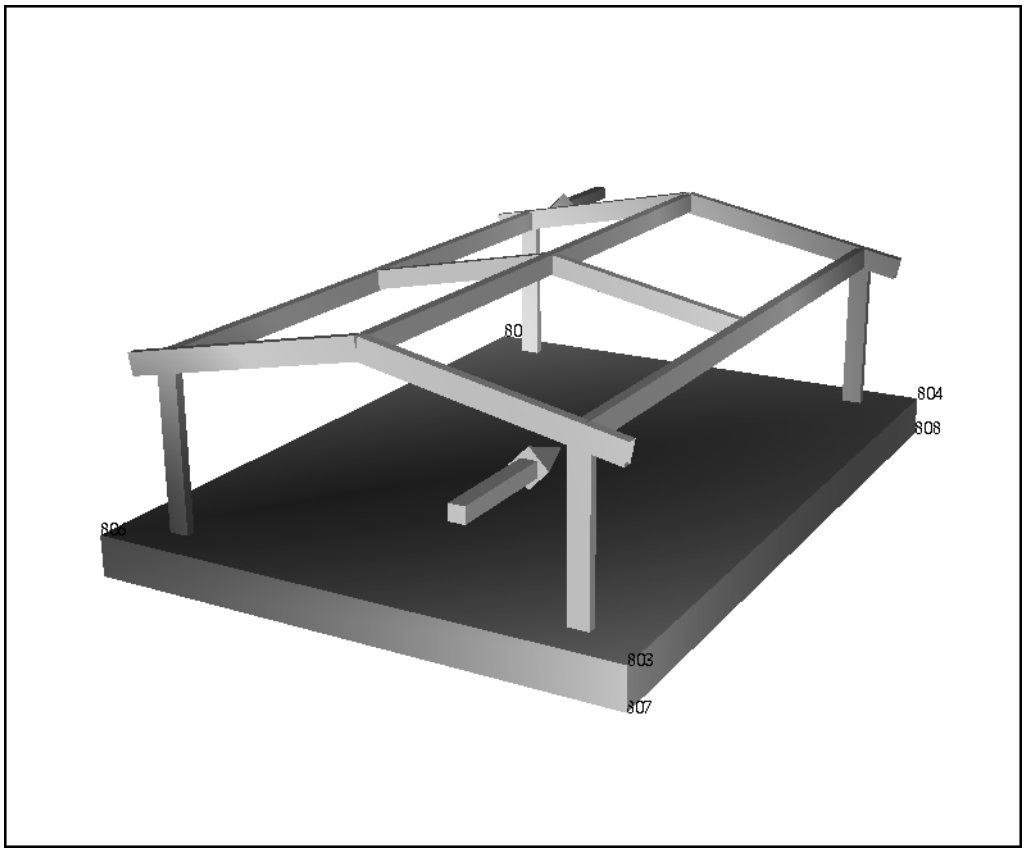
22. Select the "frame base" part in the Main Parts list.
23. Click the Part Visibility Toggle to enable display of the part.

EnSight can display node and element labels on selected parts. The label values are either provided explicitly from the dataset or are provided by EnSight. To display node labels:

24. Click the Node Label Toggle (you may have to scroll the vertical Mode Icon bar to reveal the icon) to enable node display for the "frame base" part.

See *How To Display Labels* in the online documentation for more information.

After these operations (and some rotate and zoom transformations) your Graphics Window should look something like the following. (Note that the node labels have been colored black here to contrast with the white background – your labels will be white on a black background.)



4.6 Using Online Help

EnSight 7 provides two types of documentation online:

How To — The How To documentation consists of relatively short articles that describe how to perform a specific operation in EnSight, such as change the color of an object or create an isosurface. Step-by-step instructions and pictures of relevant dialogs are included. In addition, each How To article typically contains numerous hyperlinks (colored blue) to other related articles (and relevant sections of the User Manual).

User Manual — The User Manual provides a detailed reference for EnSight.

Several documents are directly accessible from the main Help menu. The remainder can be accessed through hyperlinks, a table of contents, or an index. Most of the complex dialogs within EnSight have help buttons that will open a *How To* article. To open the *How To* table of contents:

1. Select Help > How To Table of Contents...

The EnSight online documentation uses the Acrobat® Reader software from Adobe Systems, Inc. Acrobat Reader provides much the same functionality as a World Wide Web browser while providing greater control over document content quality. The user interface is very simple and provides intuitive navigation controls. Keep in mind that the pages were designed to be viewed at 100% magnification. Although you can use other magnification settings, the quality of the dialog images may be degraded.

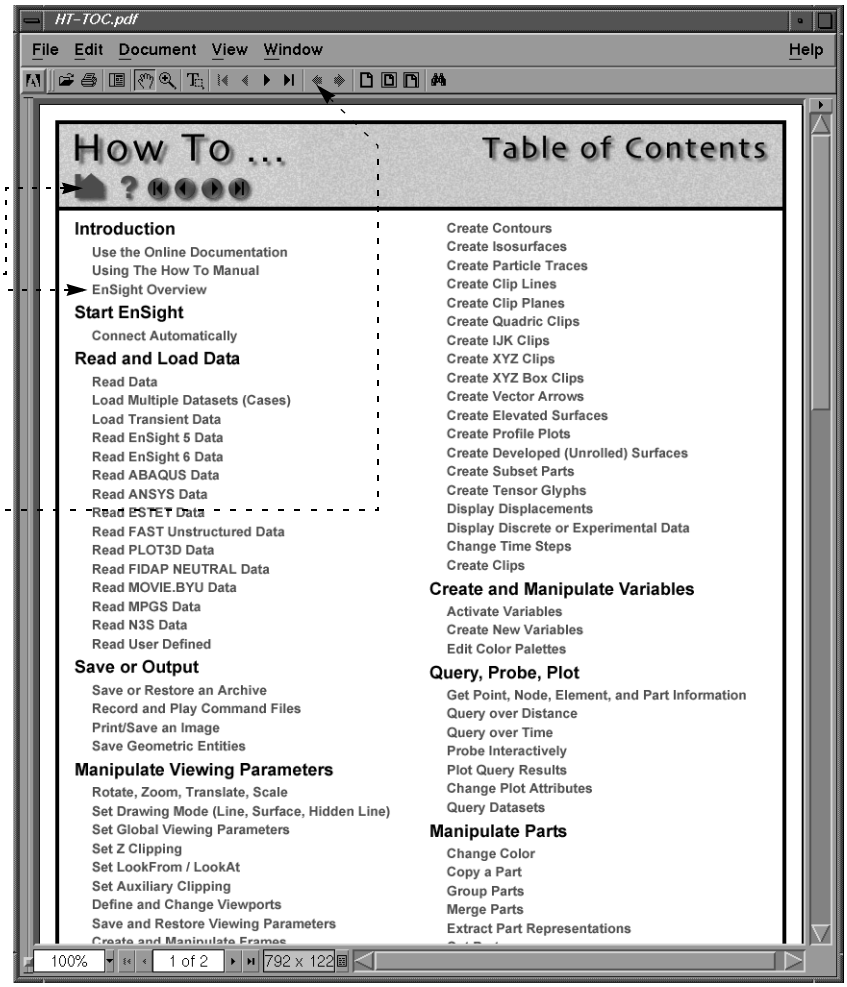
The three most important things to remember are:

- Clicking on the house icon will return you to the How To table of contents.
- Blue text is a link: clicking on it will jump to a new location.
- You can go back to the previously viewed page by clicking the back button (very similar to a Web browser).

The *How To* articles are heavily cross-linked and also provide links to relevant sections of the *User Manual*.

For more information on using Acrobat Reader (including printing) and the *How To* documentation, click on the question mark.

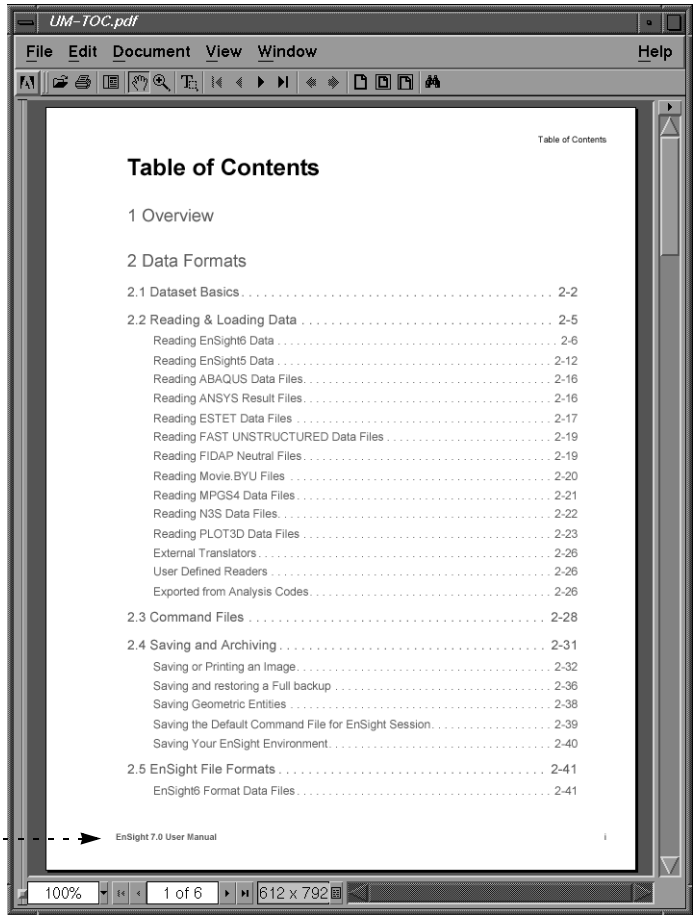
(Note: The image at the right is for a Unix system. The Windows NT version looks similar)



To access the *User Manual* table of contents:

1. Click the iconify button to close the Acrobat Reader window.
2. Select Help > User Manual Table of Contents... from the EnSight Main menu.
3. The *User Manual* contains blue hypertext links just like the *How To* articles: you can click on items and jump to a new location:

- chapter and section entries in the table of contents
- index entries in the index
- cross references in the text that begin “See ...”
- the footer of every page will jump back to the title page of the User Manual (from which you can jump to any chapter).



Printing the documentation

Adobe Acrobat .pdf files for all documentation are included on the EnSight CD distribution (and were placed in the $ENSIGHT7_HOME/doc/Manuals directory during the installation process). These documents (GettingStarted.pdf, HowTo.pdf, and UserManual.pdf) have been optimized for printing and formatted for letter-size paper.

You can open these files and print any or all pages from within Acrobat, or you can send them out for printing.

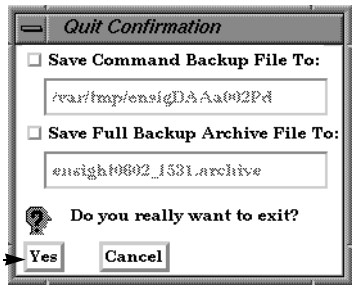
4.7 Exiting EnSight

All EnSight actions have a counterpart in the EnSight command language. During a session, all actions are being recorded to a default command file. When you exit EnSight, you have the option of saving this command file.

To quit EnSight:

1. Select File > Quit... from EnSight's Main menu. The Quit Confirmation dialog opens.

2. Click Yes to exit EnSight.



If you toggle on Save Command Backup File To and save the commands (for example, to a file called `file.cmd`), you could then start a subsequent Unix version EnSight session (from the same starting directory) with the command:

```
% ensight7 -p file.cmd
```

(assuming you are running stand-alone) to duplicate the entire session. You could accomplish the same thing by starting EnSight normally and then playing the command file from the command dialog (this would be the normal way to do it in the Windows NT version). See *How To Record and Play Command Files* in the online documentation for more information.

Note that the Quit Confirmation dialog also provides an option to save a "Full Backup Archive File". An archive (which is saved for both the Client and the Server), contains a binary dump of the complete state of the system. Unlike replaying a command file (which has to re-execute every action), the restoration of an archive occurs very fast since only the saved state is restored. See *How To Save or Restore an Archive* in the online documentation for more information.

4.8 Where's the Rest?

After successfully completing this tutorial, you should proceed to the next demonstration. Although the next tutorial contains some material applicable to all users, it is intended primarily for analysts doing computational fluid dynamics (CFD) work. If your application area is not CFD, you may wish to consider skipping the next chapter and proceeding directly to Chapter 5.

The online documentation contains details on the operations covered in the chapter. The following online articles are relevant to the topics covered here.

Consult...	For More Information On...
How To Read Data	specifying data to read into EnSight
How To Read <format> Data	reading the <format> data format.
How To Rotate, Zoom, Translate, Scale	performing transformations in the Graphics Window as well as performing precise transformations using the Transformation Editor
How To Reset Tools and Viewports	resetting transformations back to the default settings
How To Define and Change Viewports	creating and editing user-defined viewports
How To Select Parts	selecting parts
How To Set Attributes	setting part attributes

5 Flow Visualization Example: Unstructured Mesh

This chapter provides step-by-step instructions for performing many basic postprocessing operations – especially those relevant to computational fluid dynamics analysis. After successfully completing this chapter, you should be able to:

- create a clipping plane and display contours and vector arrows on the plane,
- move the clipping plane with the mouse (interactive clipping),
- create an isosurface and change the isovalue interactively,
- create a single particle trace and a rake of traces,
- move the rake of traces with the mouse (interactive particle tracing),
- animate particle traces,
- save an image of the Graphics Window to a file.

5.1 Starting EnSight

If you successfully performed the installation verification as described in *Verifying the Installation* on page 1-15, you have already started EnSight and connected the Client and Server. The same operation will be performed here.

To start EnSight, execute the following instructions for your particular installation type (stand-alone or distributed).

Starting EnSight for Stand-alone Use

If your installation of EnSight is stand-alone (*i.e.* the Client and Server are both running on the same workstation), you can use these simplified steps to start EnSight and *auto-connect* the Client and Server processes.

For Unix Systems:

You should be logged in to the console of the workstation on which the EnSight Client and Server have been installed. In addition, the `ENSIGHT7` environment variables, as well as your command search path, must be set up correctly as described on page 1-8.

1. Change to the directory containing the aerospace dataset. (The dataset contained in this directory will be loaded into EnSight in section 5.2.)

   ```
   % cd $ENSIGHT7_HOME/data/ami
   ```

2. Start EnSight using the `ensight7` shell script:

   ```
   % ensight7
   ```

For NT Systems:

1. Choose EnSight7 from the Start > Programs menu.

This will automatically start the Client and the Server and make the connection. To see if the connection is successful, you can click on the Info... button on the Desktop. You should see “Connection accepted” in the EnSight Message Window which comes up. Licensing information (licensee and expiration date) should also appear in the lower left corner of the Graphics Window. You should now close the EnSight Message Window and proceed to the next section.

If the connection failed, please consult *Troubleshooting the Connection* on page 1-17 before contacting CEI support.

Starting EnSight for Distributed Use

If your installation of EnSight is distributed (*i.e.* the Client and Server are running on different computer systems), use the steps given below to start EnSight. Note that this operation is a *manual connection*. EnSight can be set up to perform the connection automatically. See *How To Connect Automatically* in the online documentation for details.

In the instructions that follow, *`CLIENT_HOST`* refers to the system on which the EnSight Client was installed and *`SERVER_HOST`* refers to the system on which the EnSight Server was installed.

The instructions also assume that the ENSIGHT7 environment variables as well as the command search path have been set up correctly as described on page 1-8.

For UNIX Systems:

1. Log on to the console of *CLIENT_HOST* and open at least two shell windows. Since the EnSight user interface will open on the right side of your screen, place the two shell windows on the left side.
2. In the first shell window, start the EnSight Client:

   ```
   % ensight7.client -cm
   ```

   The -cm option tells the Client to begin listening for a connection from the Server. The EnSight Client user interface should appear on your workstation screen.
3. In the second shell window on your workstation, log on to *SERVER_HOST*:

   ```
   % telnet SERVER_HOST
   ```

4. In the second shell window, change to the directory containing the aerospace dataset. (The dataset contained in this directory will be loaded into EnSight in section 5.2.)

   ```
   % cd $ENSIGHT7_HOME/data/ami
   ```

5. In the second shell window, start the EnSight Server:

   ```
   % ensight7.server -c CLIENT_HOST
   ```

   The -c *CLIENT_HOST* option tells the EnSight Server to connect to the EnSight Client listening on *CLIENT_HOST.*

For NT Systems:

1. Log on to the *CLIENT_HOST*. Double click the ens6cl.exe icon located in the *INSTALL_DIRECTORY*\machines\win32 folder.
2. Bring the Connection dialog up, by File > Connect Server...
3. Change the “Type” to “Manual”.
4. Click the “Connect Server” button.
5. If the *SERVER_HOST* is a UNIX machine, follow steps 3 through 5 in the “For UNIX Systems” above. If the *SERVER_HOST* is a NT machine, continue with these instructions.

   Log on to the *SERVER_HOST*. Double click (or run, if you telnet to the machine) the ens7sv.exe icon located in the *INSTALL_DIRECTORY*\machines\win32 folder.
6. In the resulting application console window, enter the name of the *CLIENT_HOST* machine.

The server should make the connection. To see if the connection is successful, you can click on the Info... button on the Desktop. You should see “Connection accepted” in the EnSight Message Window which comes up. Licensing information (licensee and expiration date) should also appear in the lower left corner of the Graphics Window. You should now close the EnSight Message Window and proceed to the next section.

If the connection failed, please consult *Troubleshooting the Connection* on page 1-17 before contacting CEI support.

Distributed Use - Automatic Connection

You can perform an *automatic connection* where the Server starts automatically and connects to the Client, even though the two processes are on different host systems. This type of connection requires some initial setup and is not discussed in the *Getting Started* manual. However, once configured, the automatic connection lets you start a session in a single step. See *How To Connect Automatically* in the online documentation for details. (For information on the online help facility, see *Using Online Help* on page 4-20.)

5.2 Reading a Dataset

In this demonstration, we will load a simple CFD model of a hypersonic vehicle with an 8 degree angle of attack and a 6 degree side-slip. The dataset includes velocity and pressure values.

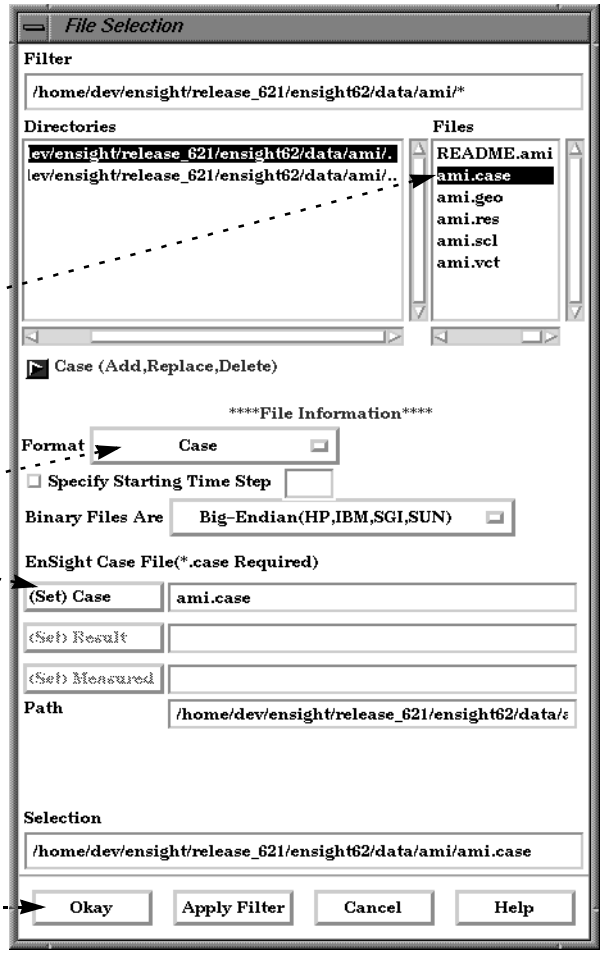
1. Select File > Data (Reader)... from the Main EnSight menu.

This opens the File Selection dialog.

For UNIX: Since we initially started EnSight (in the previous section) from the desired directory (`$ENSIGHT7_HOME/data/ami`), this directory is opened automatically (as seen in the Directories list).

For NT: You will be in the machines\win32 directory. You need to go up two levels by twice double clicking on the .. directory, then go down to `data`, then the `ami` directory.

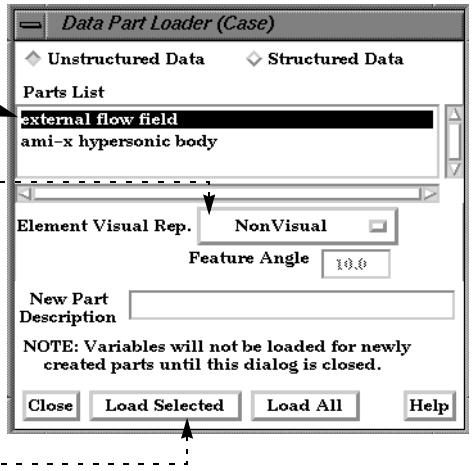
2. Click `ami.case` in the Files list.
3. Be sure the Format is set to Case (it is by default).
4. Click (Set) Case to set the casefile to the file currently selected in the Files list (*i.e.* `ami.case`).
5. Click Okay to accept the selections and close the dialog window.



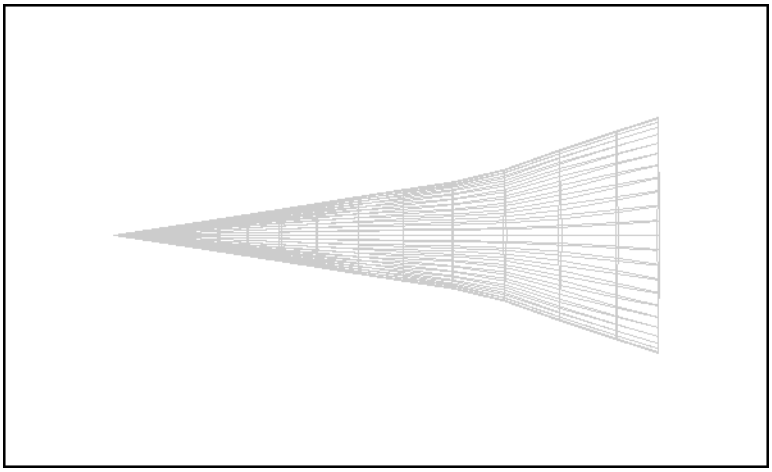
When the File Selection dialog is closed, EnSight reads the file and opens the Data Part Loader dialog. During the initial read, EnSight determines the individual parts available in the file.

EnSight supports several different *representations* for parts. A part's representation controls how it is displayed on the EnSight Client. The default representation is "3D Border, 2D Full" (which displays all unshared element faces for 3D data and all 2D elements). Another representation is "NonVisual" which essentially means that the EnSight Client has no graphical representation of the part at all. The NonVisual representation is most useful for flow field parts when you don't really need to view the flow domain to postprocess the data. See *How To Change Visual Representations* in the online documentation for more information on part representations.

6. Click to select the first part in the list, "external flow field".
7. Click Element Visual Rep. and change the setting to "NonVisual".
8. Click Load Selected.
9. Click to select the second part in the list, "ami-x hypersonic body".
10. Click Element Visual Rep. and change the setting to "3D Border, 2D full".
11. Click Load Selected.
12. Click Close.



The two constituent parts are now listed in the Main Parts list but only the hypersonic body part is displayed in the Graphics Window:

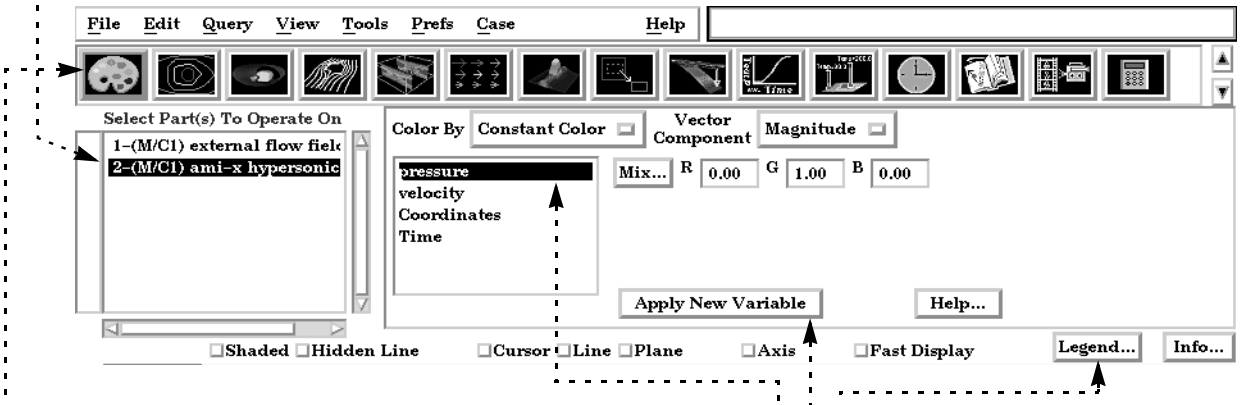


Note: *To improve the legibility of the* Getting Started *manual, all images of the Graphics Window are shown with a white background rather than the default black background that EnSight uses.*

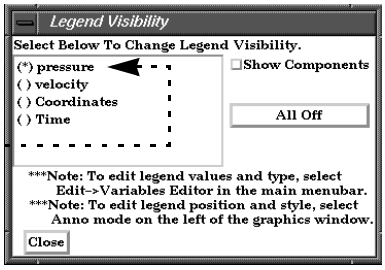
5.3 Feature Demonstration

Unlike the dataset used in the previous chapter, this data contains two variables: pressure and velocity. The first step is to color the model by the pressure variable and display a color legend showing the mapping from variable values to color.

1. Select the “ami-x hypersonic body” part in the Main Parts list.



2. Click the Color icon in the Feature Icon bar to open the Quick Interaction area for Color.
3. Select pressure Variable.
4. Click Apply New Variable in the Quick Interaction area to color the selected part by the selected variable.
5. Click Legend... to bring up the Legend Visibility dialog.
6. Select Pressure in the list.

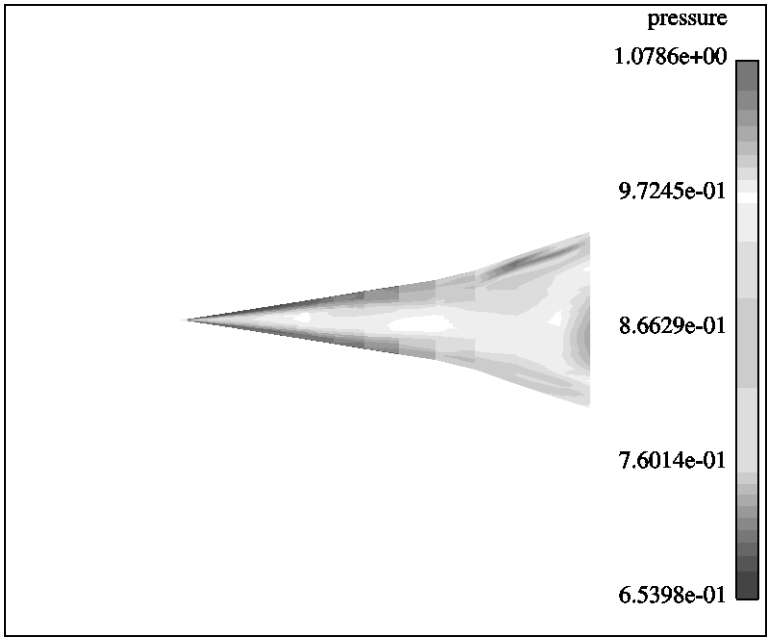


The color legend appears to the right of the model in the Graphics Window. Color legends have many display attributes – see *How To Create Color Legends* in the online documentation for more information.

Change the display to hidden surface:

7. Click the Shaded Toggle on the desktop to enable shaded surface display for all parts.

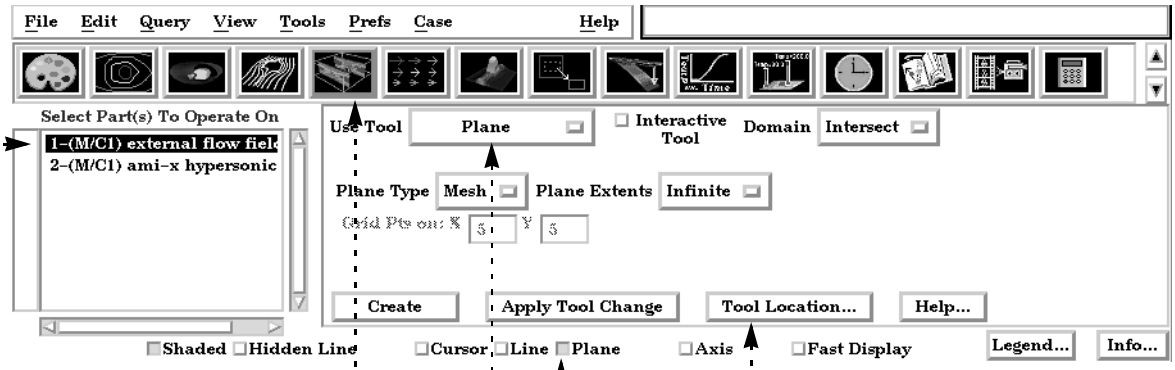
Your Graphics Window should appear as follows:



In the next sequence of operations, we will create a new part: a clip using EnSight's *Plane tool*. The Plane tool is a 3D icon in the Graphics Window that can either be manipulated with the mouse or moved precisely using the Transformation Editor.

Once the clipping plane has been created, we will build additional parts (a contour and vector arrows) using the clipping plane as the parent part.

8. Select the "external flow field" part in the Main Parts list.



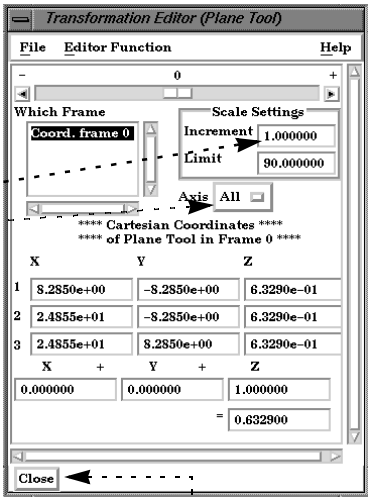
9. Click the Clip icon in the Feature Icon bar.
10. Change "Use Tool" to Plane.
11. Click the Plane tool toggle on the desktop to display the Plane tool.

The Plane tool appears in the Graphics Window.

12. Click Tool Location in the Quick Interaction area.

This opens the Transformation Editor ready to manipulate the Plane tool.

13. In the Transformation Editor, change the Axis to Y.
14. Double-click the Increment field to select the "1.000000" value. Type "90" and press return.



This will rotate the Plane tool 90 degrees about its Y axis. The tool should now be parallel to our line of sight (and perpendicular to the direction of flow).

15. In the Transformation Editor, select Editor Function > Global Transform (to return to global transforms rather than Plane tool transforms).
16. In the Transformation Editor, click Close.
17. Click Create in the Quick Interaction area to create the new clip part.

Note that a new part "Clip_plane" is now listed in the Main Parts list. There is also a new part in the Graphics Window but you cannot see it since it is perfectly parallel to our line of sight: rotate the model to see the clipping plane.

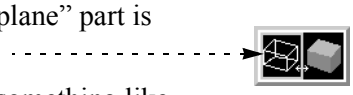
18. Click Rotate in the Transformation Control area. Move the mouse pointer into the Graphics Window, click and hold the left mouse button and drag to rotate the model.

By default, the clip plane is not confined to the bounds of the Plane tool – it extends to the edge of its parent part (the "external flow field"). You can, however, restrict the clip to the bounds of the Plane tool:

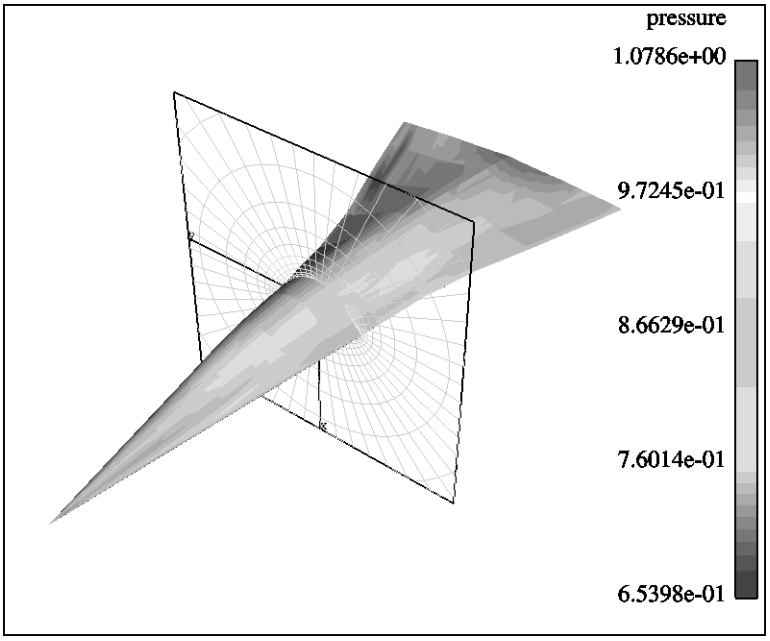
19. Click the Plane Extents button in the Quick Interaction area and change the value to Finite. The clip part automatically recalculates.

The new “Clip_plane” part listed in the Main Parts list has attributes just like the original model parts. For example, we can color the part based on the value of a variable and change other attributes as well.

20. Select the “Clip_plane” part in the Main Parts list.
21. Click the Color icon in the Feature Icon bar to open the Quick Interaction area for Color.
22. Select velocity in the variables list.
23. Click Apply New Variable in the Quick Interaction area to color the selected part by the selected variable.
24. Click the Part Shaded Toggle to disable shaded surface display for the selected parts (the “Clip_plane” part is still selected in the Main Parts list).



Your Graphics Window display should look something like the following:

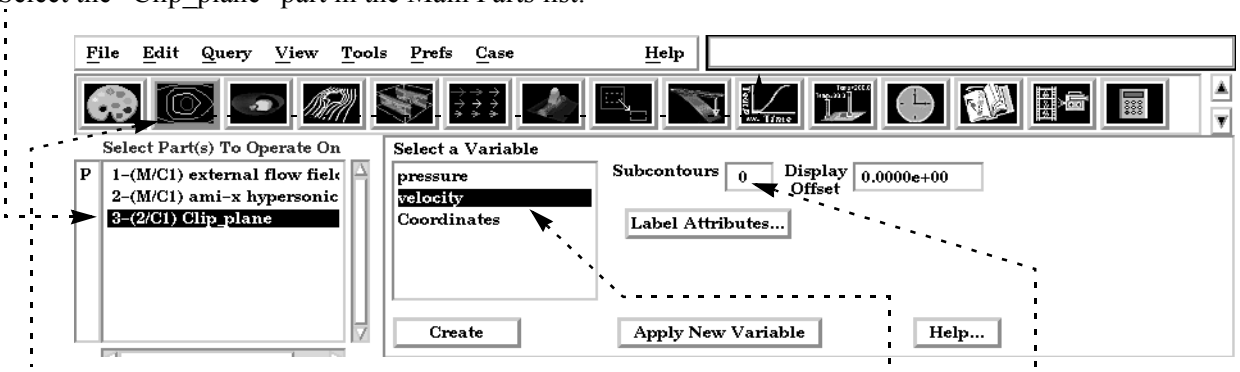


Note that this is the primary operational mode of EnSight for creating new parts:

- One or more parts are selected in the Main Parts list (the parent(s)).
- A Feature is selected from the Feature Icon bar.
- If necessary, a variable is selected in the variables list.
- Desired changes are made to the Quick Interaction area for the selected Feature.
- The Create button is clicked in the Quick Interaction area to create the new part.
- Any desired attributes are set for the new part using Part Mode.

The clip plane was built using the external flow field as the parent part. Since the clip plane is itself a valid part, it can be used as a parent part to create other parts. To create contour loops of velocity on the clip plane:

25. Select the “Clip_plane” part in the Main Parts list.

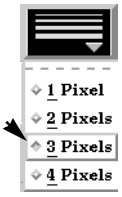


26. Click the Contour icon in the Feature Icon bar to open the Quick Interaction area for Contours.
27. Select Velocity in the variable list.
28. Change the value of the Subcontours fields to 3 and press return.
29. Click Create to build the new contour part.

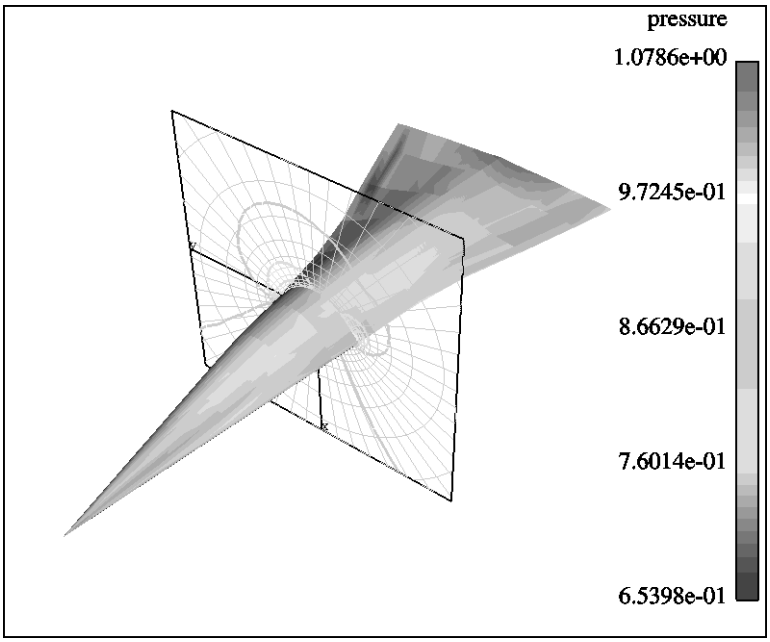
By default, EnSight creates a contour loop at each *level* in the color palette assigned to the selected variable. Levels are evenly spaced values that span from the minimum to the maximum range of the variable. Default color palettes have five levels. The subcontour value sets the number of additional contour loops that will be calculated *between* each level. In this case, 17 total contours will be calculated: ((5–1)*3)+5.

The contour loops appears as white lines on the clip plane part. We can change the color and line width to make them more visible:

30. Click Color in the Feature Icon bar and then click Apply New Variable button in the Quick Interaction area to color the selected part (“Contour part”) by the selected variable (velocity).
31. Click the Part Line Width pulldown and set the width to 3 pixels.



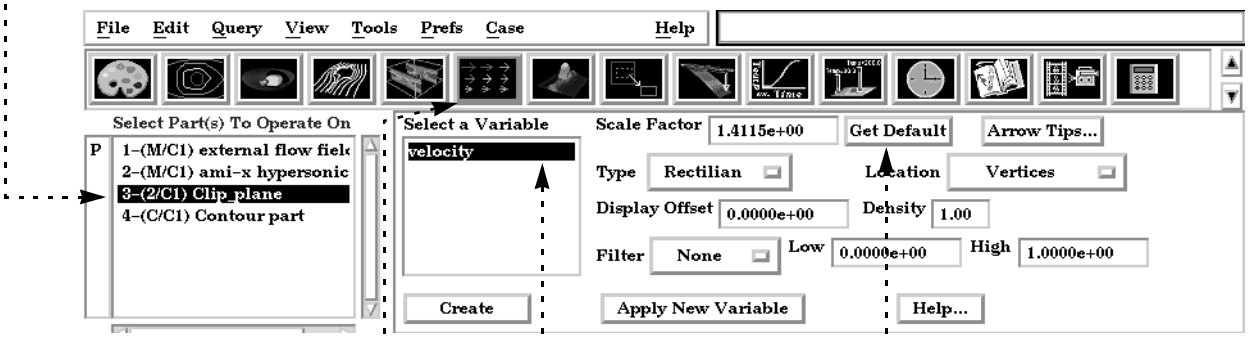
Your Graphics Window should look something like the following:



See *How To Create Contours* in the online documentation for more information on contours and how color palettes affect contours.

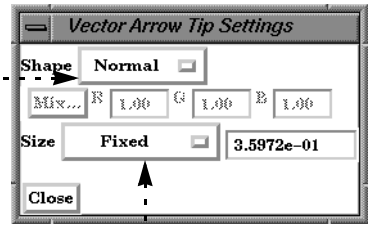
Other parts can be created on the clip part as well. To place vector arrows at each node of the clip plane:

32. Select the “Clip_plane” part in the Main Parts list.



33. Click the Vector Arrows icon in the Feature Icon bar to open the Quick Interaction area.
34. Select velocity in the variables list.
35. Click Create to build the new vector arrow part.
36. If the vector scaling isn’t pleasing, you can get reasonable defaults by clicking Get Default.

By default, vector arrows are straight lines originating from the nodes of the parent part(s) and projecting in the direction of the local vector variable with length scaled by the Scale Factor value. Vector arrows have a number of styles controlling appearance.



37. Click Arrow Tips... in the Quick Interaction area to open the Vector Arrow Tip Settings dialog.
38. Change the Shape setting to Normal.
39. Change the Size to Fixed.
40. Click Close.

Experiment with other vector tip styles. See *How To Create Vector Arrows* in the online documentation for more information on vector arrows.

All clip parts in EnSight can be interactive: the tool that created the part can be grabbed with the mouse and moved. Once you release the mouse button, any parts that depend on the clip (*i.e.* that have the clip part as a parent), are automatically recalculated to reflect the new condition of the parent. So that the Plane tool can be easily manipulated, the hypersonic body will first be made invisible.

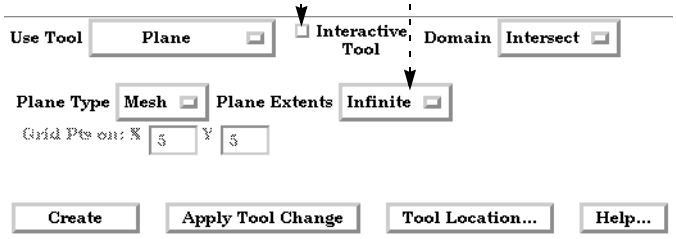
41. Click to select the “ami-x hypersonic body” in the Main Parts list.
42. Click the Part Visibility Toggle (in the Mode Icon bar) to disable display of the part.

The Plane tool can be manipulated with the mouse in several ways. In this example, the Plane tool will be translated. See *How To Use The Plane Tool* in the online documentation for details on manipulation.

43. Double-click the “Clip_plane” part in the Main Parts list.

Double-clicking a created part opens the Quick Interaction area for the part type and loads the part specific information. Any changes in the Quick Interaction area will affect only that part.

44. Change the Plane Extents value back to Infinite.
45. Click Interactive Tool in the Quick Interaction area.
46. Move the mouse into the Graphics Window and place the pointer directly over the center of the Plane tool (the place where the three Plane axes intersect).
47. Click and hold the left mouse button and drag the mouse left and right.



As the Plane tool is translated, the clip plane and vector arrow parts automatically recalculate and redisplay.

48. Release the mouse button.

The contour part now recalculates to reflect the ending location of the clip plane. You can also use the Transformation Editor to perform precise transformations on the tool.

49. Click Interactive Tool in the Quick Interaction area again to disable interactive operation.

Any kind of part (model or created) can be deleted. Note that a deletion cannot be undone.

50. Select all the created parts in the Main Parts list: place the mouse pointer over part 3, click the left mouse button and drag down until parts 4 and 5 are selected as well.

Note: *On some platforms (for example, HP) you cannot begin your click-drag select operation on a selected item. To select 3–5, first click to select item 2, and then perform the click-drag as described.*

51. Select Edit > Part > Delete and confirm the deletion.

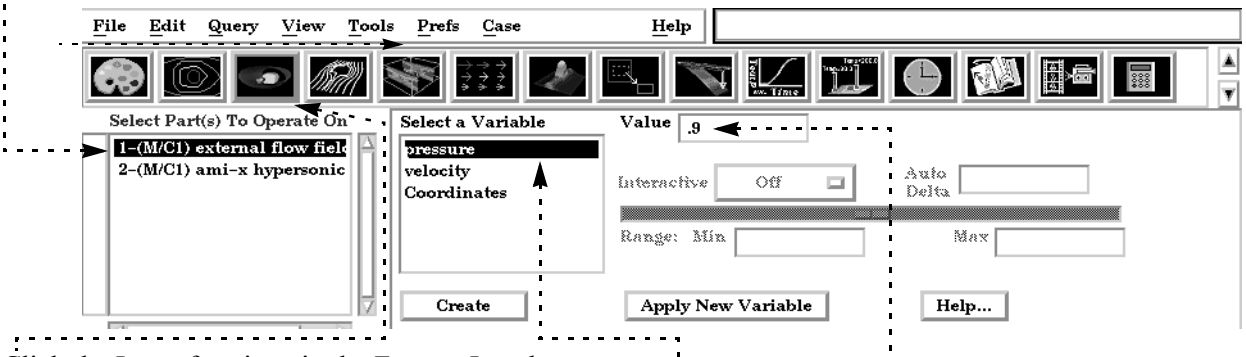
The parts are removed from the display and the Main Parts list.

52. Select “ami-x hypersonic body” in the Main Parts list.
53. Click the Part Visibility Toggle (in the Mode Icon bar) to enable display of the part.

54. Select Plane on the Desktop to toggle off display of the Plane tool.

Another type of created part is an *isosurface*. An isosurface is a surface of constant value (the *isovalue*) in a 3D field. The region on one side of the isosurface has values greater than the isovalue and the region on the other side has values less than the isovalue. To create an isovalue:

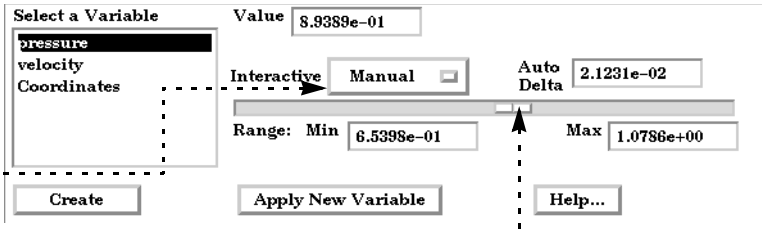
55. Select the "external flow field" part in the Main Parts list.



56. Click the Isosurface icon in the Feature Icon bar to open the Quick Interaction area.
57. Select pressure in the variables list.
58. Double-click the Value field to select the "1.0" value. Type "0.9" and press return.
59. Click Create to build the isosurface part.
60. Click Color in the Feature Icon bar, then in the Quick Interaction area, select pressure in the variable list, and click Apply New Variable to color the isosurface part by pressure.

Note that the color of the isosurface (green) corresponds to the 8.6629e-01 level of the pressure color legend (which is close to our chosen isovalue of 0.9).

Isosurfaces can be interactive. Manipulating a slider changes the isovalue and the isosurface is recalculated and redisplayed.



61. Double-click the "Isosurface part" in the Main Parts list to open the Quick Interaction area for that part.
62. Change the Interactive setting from Off to Manual.
63. Grab the slider and move it left and right.

The isosurface changes as the slider is moved.

64. Change the Interactive setting back to Off.
65. Select Edit > Part > Delete (and confirm the deletion) to remove the isosurface part.

See *How To Create Isosurfaces* in the online documentation for more information.

EnSight provides particularly powerful tools for exploring flow with particle traces. Traces can emitted from a point, a line, a plane, or even the nodes of an arbitrary part. A trace emitter can be made interactive: moving the emitter with the mouse will recalculate and redisplay the traces. In this example, a simple point trace will be created.

66. Click Reset... in the Transformation Control area and then click Reinitialize in the Reset Tools and Viewport(s) dialog to reset the model position. Click the Close button to remove the dialog.
67. Click the Cursor tool toggle on the desktop.

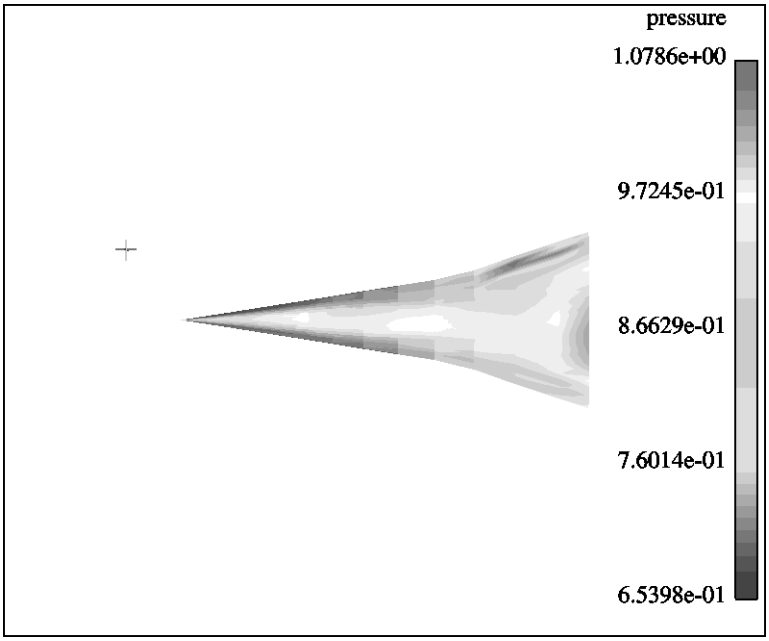
The Cursor tool is used to specify the position of a 3D point and, in this case, will be used to set the location of the particle trace emitter. Unfortunately, the Cursor is initialized to the origin of the coordinate system – which is currently *inside* the hypersonic body part. The part needs to be made temporarily invisible so the Cursor can be moved.

68. Select the “ami-x hypersonic body” part in the Main Parts list.
69. Click the Part Visibility Toggle to disable display of the part.

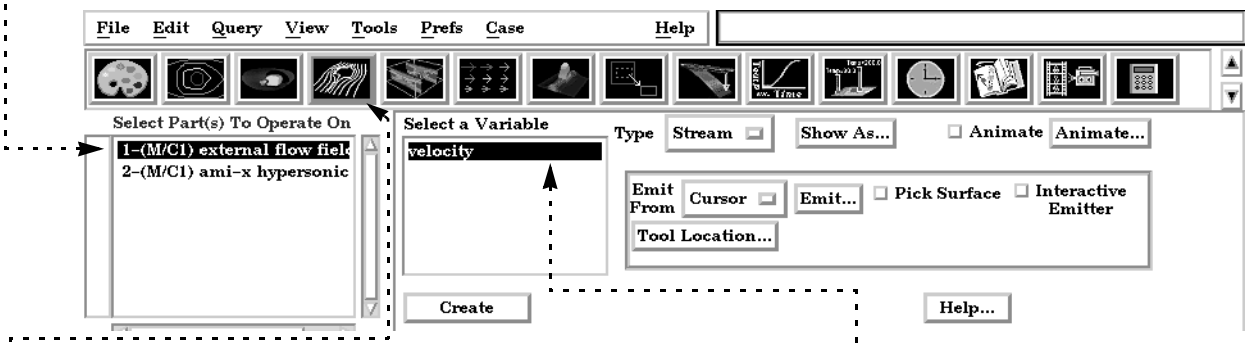
You should now see the Cursor tool (the red, green, blue cross) in the center of the screen.

70. Move the mouse pointer into the Graphics Window and directly on top of the center of Cursor tool.
71. Click and hold the left mouse button and drag the Cursor to a location up and to the left (see image below).
72. Click the Part Visibility Toggle to re-enable display of the hypersonic body part.

Your Graphics Window should look something like the following:



73. Select the “external flow field” part in the Main Parts list.



74. Click the Particle Traces icon in the Feature Icon bar to open the Quick Interaction area.
75. Select velocity in the variable list.

The Emit From setting in the Quick Interaction area is set to Cursor by default.

76. Click Create to trace the particle.

The trace should be visible extending from the Cursor tool to the right and down over the hypersonic body. See *How To Use the Cursor (Point) Tool* in the online documentation for more information on manipulating the Cursor tool.

EnSight can also trace from the Line tool to create a rake of particles.

77. Select Edit > Part > Delete to remove the particle trace part.
78. Select Tools > Cursor to disable display of the Cursor tool.
79. Select the “external flow field” part in the Main Parts list.
80. Select velocity in the variables list.
81. In the Quick Interaction area, change the Emit From setting to Line.

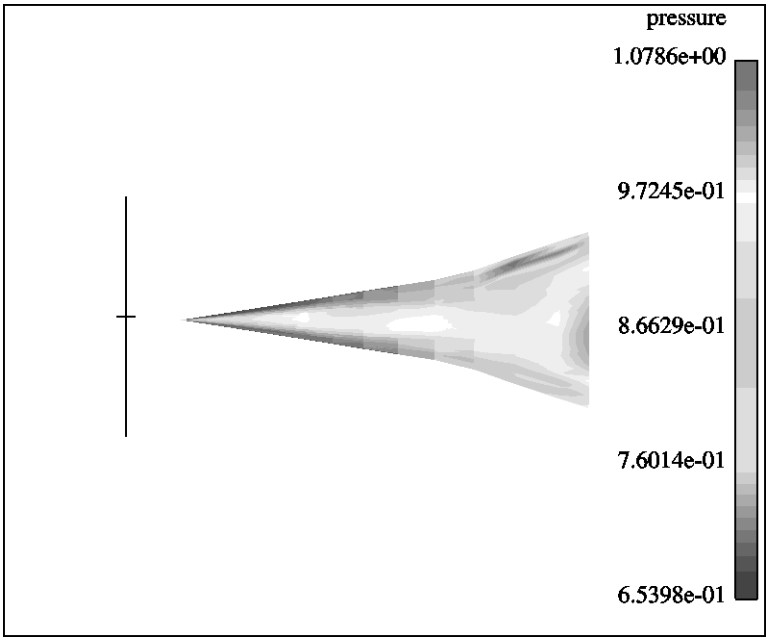
This selection displays the Line tool which is also completely enclosed within the hypersonic body part.

82. Select the “ami-x hypersonic body” part in the Main Parts list.
83. Click the Part Visibility Toggle to disable display of the part.

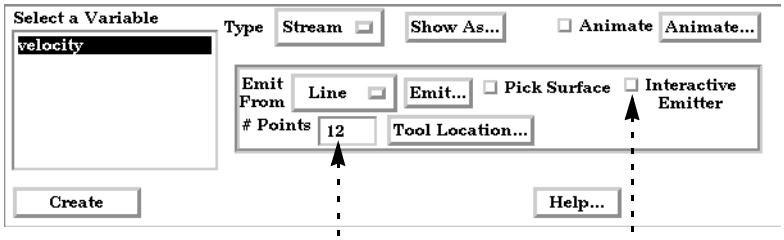
The Line tool (oriented horizontally) should now be visible.

84. Move the mouse pointer into the Graphics Window and directly on top of the center of Line tool.
85. Click and hold the left mouse button and drag the Line to a location up and to the left.
86. Click the Part Visibility Toggle to re-enable display of the hypersonic body part.
87. Move the mouse pointer back into the Graphics Window and directly over the right end of the Line tool.
88. Click and drag the end of the Line tool down and to the left such that the Line is vertically stretched across the front of the hypersonic body (see image below).

Your Graphics Window should look something like the following:



89. Select the "external flow field" part in the Main Parts list.
90. If needed, re-select velocity in the variable list.
91. In the Quick Interaction area, change the # Points field to 12 and press return.



92. Click Create to create the rake of traces.

This operation created 12 evenly spaced traces along the Line tool.

Interactive particle traces are particularly useful for exploring fluid flow.

93. Click Interactive Emitter.
94. Move the mouse pointer into the Graphics Window and directly over the center of the Line tool.
95. Click and hold the left mouse button and drag the Line tool up and down. Release the mouse button.

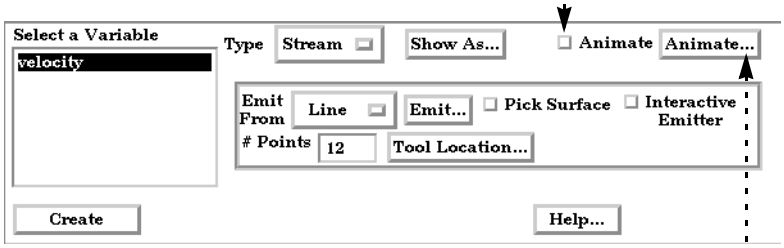
The constituent traces are recalculated and redisplayed as the Line tool moves. It may help to rotate the model to a new orientation and then move the Line tool again.

See *How To Create Particle Traces* in the online documentation for more information on particle tracing.

Particle traces can be animated to provide intuitive comprehension of flow characteristics. Traces are animated by displaying one or more *tracers* on all traces of the trace part. A tracer moves along the path of a trace with length proportional to the local velocity. EnSight provides complete control over all aspects of the tracers including length, speed, and release interval for multiple pulses.

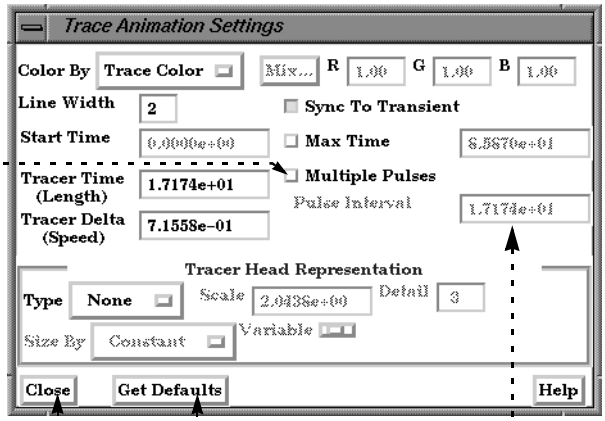
97. Click Animate in the Quick Interaction area and move the mouse pointer into the Graphics Window.

The tracers can be seen moving down the length of the traces. Numerous controls are provided for altering the appearance and behavior of the tracers.



98. Click Animate.. to open the Trace Animation Settings dialog.

99. Click Get Defaults to load suitable default values to the various trace parameter fields.



100. Click Multiple Pulses and move the mouse pointer into the Graphics Window.

Note that there are now several tracers are moving down each trace. The Pulse Interval field controls the spacing between tracers.

101. Double-click in the Pulse Interval field to select the value. Type “10” and press return.

102. Double-click in the Tracer Time field to select the value. Type “1” and press return.

103. Double-click in the Tracer Delta field to select the value. Type “0.3” and press return.

104. Click Close.

Move the mouse into the Graphics Window to view your changes. Animating traces often look better with the trace part invisible.

105. Click the Part Visibility Toggle to disable display of the particle trace part.

106. Move the mouse back into the Graphics Window to view the animation.

107. Select Tools > Line to remove the Line tool.

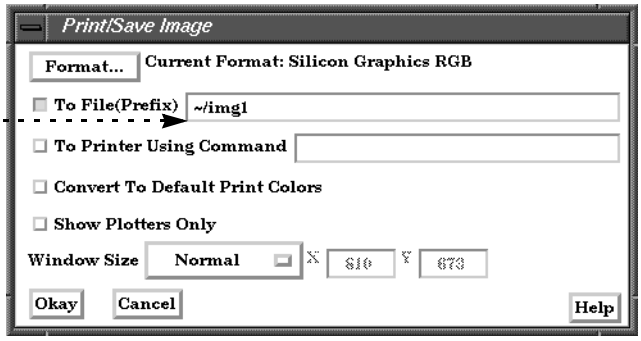
See *How To Animate Particle Traces* in the online documentation for more information on trace animation.

5.4 Saving Files

Saving Images

EnSight supports several formats for image output. In this example, both PostScript and Silicon Graphics RGB files will be saved.

1. Select File > Print/Save Image... to open the Print/Save Image dialog.



By default, SGI RGB is selected. To save the current contents of the Graphics Window:

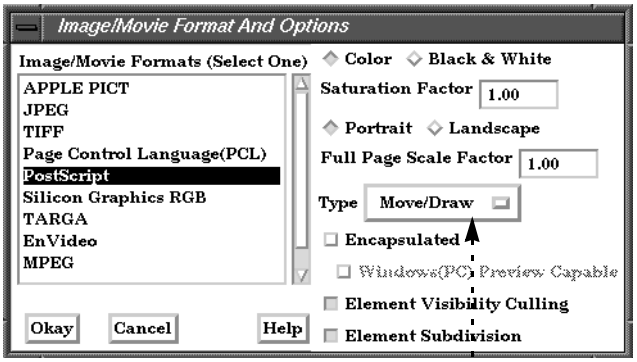
2. Enter a file name in the To File field.

Note: *By default, EnSight will save images in the directory from which the Client is started. Since this directory is part of the EnSight distribution, it is probably write protected. To save the image in your home directory instead, on a Unix system prefix the filename with "~/". On a Windows NT system, use "~\".*

3. Click Okay.

For PostScript output:

1. Select File > Print/Save Image... to open the Print/Save Image dialog.
2. Click Format... to open the Image/Movie Format and Options dialog.
3. Select PostScript from the list.



By default, EnSight saves PostScript using vector (move-draw) PostScript commands for optimal quality on high resolution printers. You can also save the entire scene in pixel PostScript. For example,

4. Change the Type setting to Image Pixels.
5. Click Okay to close the dialog.

If you have a PostScript printer accessible from your workstation, you can issue the print command and send the PostScript directly to the printer. Otherwise, you can output the PostScript to a file. To print direct to a printer:

6. In the Print/Save Image dialog, click the To File button to disable file output.
7. Click the To Printer Using Command button and enter your standard printer command but DO NOT include the file name. For example, if you usually print with `lpr -Plaser1 file.ps` then enter:

```
lpr -Plaser1
```

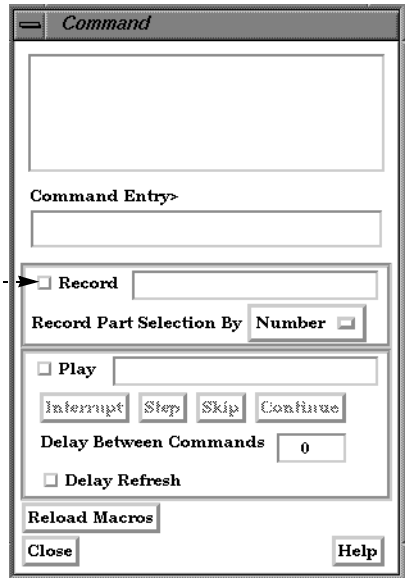
8. Click Okay to print the image.

See *How To Print/Save an Image* in the online documentation for more information on image formats and options.

Saving Commands to a File

As seen in *Exiting EnSight* on page 4-22, EnSight supports a command language. Every action you can perform in EnSight has a counterpart in the language. In addition to saving all the commands for a session, you can save a short sequence of arbitrary actions for later use. These commands can be replayed during a subsequent session or attached to a keyboard key as a macro. To save a sequence of commands:

1. Reset the model: click the Reset... button in the Transformation Control area. Click Reinitialize in the Reset Tools and Viewports dialog and then click Close.
2. Select File > Command to open the Command dialog.
3. Click Record. The File Selection dialog opens.
4. Double-click on any part of the text in the Selection field to select it. Type "~/test.cmd"(or "~\test.cmd in the NT version), and click Okay.



The commands for actions you perform will be written to test.cmd in your home directory.

5. If you wish, perform some actions such as rotating and translating the model.
6. Click Record again to stop saving commands.

You can replay a command file as well.

7. Again, reset the model (as described in step 1, above).
8. Click Play to open the File Selection dialog.
9. Click in the right end of the Selection field, type "~/test.cmd"(or "~\test.cmd in the NT version), and click Okay.

Any actions performed prior to stopping the recording should be repeated.

10. Click Close to remove the Command dialog.

See *How To Record and Play Command Files* and *How To Define and Use Macros* in the online documentation for more information.

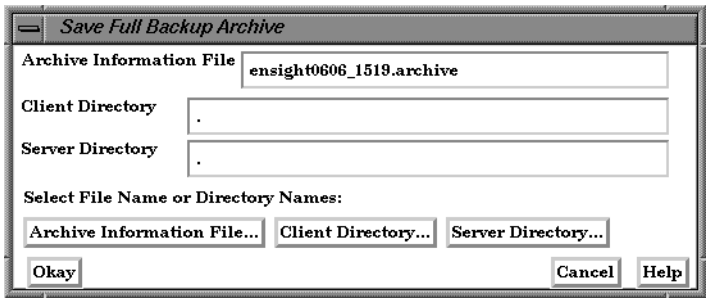
Saving an Archive

EnSight can also save the complete state of a session as an *archive*. An archive consists of two binary files containing the state of the Client and Server as well as an "Archive Information file" that stores additional information (including pointers to the two binary files).

Although you can duplicate a session by replaying a saved command file, restoring an archive is much faster. When you replay a command file, EnSight has to re-execute every action performed by the user, even if that action had no effect on the final state. An archive restores very fast since only the final state is restored.

To save an archive:

1. Select File > Save > Full Backup... to open the Save Full Backup Archive dialog.



By default, EnSight will save the archive information file and the Client archive in the directory from which the Client is started. The Server archive will be saved on the Server host (by default, in the directory from which the Server was started). Since these directories are part of the EnSight distribution, they are probably write protected. To save the archive files in your home directory instead, prefix the entries with "~/" (or "~\" if NT version):

2. Click at the beginning of the Archive Information File entry and type "~/" (or "~\" if NT version).
3. Place the mouse pointer in the Client Directory field and double-click the left mouse button. Type "~/" (or "~\" if NT version).
4. Place the mouse pointer in the Server Directory field and double-click the left mouse button. Type "~/" (or "~\" if NT version).
5. Click Okay.

You can restore an archive during a session (either immediately after the Client-Server connection or after replacing a case) by selecting File > Restore > Full Backup.... You can also have an archive automatically load at startup. For a Unix system:

```
% ensight7 -ar ~/ensight0606_1519.archive
```

This can also be done from within the user interface, which is the normal way that it would be done with the NT version. See *How To Save and Restore an Archive* in the online documentation for more information.

5.5 Where's the Rest?

After successfully completing this tutorial, if you wish to work through an example utilizing a structured mesh, you should proceed to the next chapter. Otherwise, you might prefer to jump to Chapter 6 which presents a tutorial containing some material applicable to all users, but intended primarily for analysts doing structural mechanics (finite element) analysis.

The online documentation contains details on the operations covered in the chapter. The following online articles are relevant to the topics covered here.

Consult...	For More Information On...
How To Read Data	specifying data to read into EnSight
How To Read <format> Data	reading the <format> data format.
How To Change Visual Representations	element representations
How To Create Color Legends	color legends and the variable to color mapping
How To Create Contours	creating contours
How To Create Vector Arrows	creating vector arrows
How To Use The Plane Tool	manipulating the Plane tool
How To Create Particle Traces	creating particle traces
How To Animate Particle Traces	animating particle traces
How To Print/Save an Image	printing or saving the image in the Graphics Window
How To Record and Play Command Files	recording and playing command sequences
How To Save and Restore an Archive	saving and restoring archives

6 Flow Visualization Example: Structured Mesh

This chapter is intended for users of structured mesh CFD software and those using the PLOT3D format to import data into EnSight. In addition, this chapter describes the use of the predefined CFD functions to compute variables derived from the fluid flow analysis. It is assumed that you have already worked through the features described in Chapter 4, flow visualization example for an unstructured mesh. After successfully completing this chapter, you should be able to:

- load a PLOT3D dataset
- create a part from a logical plane of the volume mesh
- create an IJK clipping plane
- use the predefined CFD functions

6.1 Starting EnSight

If you successfully performed the installation verification as described in *Verifying the Installation* on page 1-15, you have already started EnSight and connected the Client and Server. The same operation will be performed here.

To start EnSight, execute the following instructions for your particular installation type (stand-alone or distributed).

Starting EnSight for Stand-alone Use

If your installation of EnSight is stand-alone (*i.e.* the Client and Server are both running on the same workstation), you can use these simplified steps to start EnSight and *auto-connect* the Client and Server processes.

For Unix Systems:

You should be logged in to the console of the workstation on which the EnSight Client and Server have been installed. In addition, the `ENSIGHT7` environment variables, as well as your command search path, must be set up correctly as described on page 1-8.

1. Change to the directory containing the aerospace dataset. (The dataset contained in this directory will be loaded into EnSight in section 6.2.)

   ```
   % cd $ENSIGHT7_HOME/data/plot3d
   ```

2. Start EnSight using the `ensight7` shell script:

   ```
   % ensight7
   ```

For NT Systems:

1. Choose EnSight7 from the Start > Programs menu.

This will automatically start the Client and the Server and make the connection. To see if the connection is successful, you can click on the Info... button on the Desktop. You should see “Connection accepted” in the EnSight Message Window which comes up. Licensing information (licensee and expiration date) should also appear in the lower left corner of the Graphics Window. You should now close the EnSight Message Window and proceed to the next section.

If the connection failed, please consult *Troubleshooting the Connection* on page 1-17 before contacting CEI support.

Starting EnSight for Distributed Use

If your installation of EnSight is distributed (*i.e.* the Client and Server are running on different computer systems), use the steps given below to start EnSight. Note that this operation is a *manual connection*. EnSight can be set up to perform the connection automatically. See *How To Connect Automatically* in the online documentation for details.

In the instructions that follow, *`CLIENT_HOST`* refers to the system on which the EnSight Client was installed and *`SERVER_HOST`* refers to the system on which the EnSight Server was installed.

The instructions also assume that the ENSIGHT7 environment variables as well as the command search path have been set up correctly as described on page 1-8.

For UNIX Systems:

1. Log on to the console of *CLIENT_HOST* and open at least two shell windows. Since the EnSight user interface will open on the right side of your screen, place the two shell windows on the left side.
2. In the first shell window, start the EnSight Client:

   ```
   % ensight7.client -cm
   ```

   The -cm option tells the Client to begin listening for a connection from the Server. The EnSight Client user interface should appear on your workstation screen.
3. In the second shell window on your workstation, log on to *SERVER_HOST*:

   ```
   % telnet SERVER_HOST
   ```

4. In the second shell window, change to the directory containing the aerospace dataset. (The dataset contained in this directory will be loaded into EnSight in section 6.2.)

   ```
   % cd $ENSIGHT7_HOME/data/plot3d
   ```

5. In the second shell window, start the EnSight Server:

   ```
   % ensight7.server -c CLIENT_HOST
   ```

   The -c *CLIENT_HOST* option tells the EnSight Server to connect to the EnSight Client listening on *CLIENT_HOST.*

For NT Systems:

1. Log on to the *CLIENT_HOST*. Double click the ens7cl.exe icon located in the *INSTALL_DIRECTORY*\machines\win32 folder.
2. Bring the Connection dialog up, by File > Connect Server...
3. Change the “Type” to “Manual”.
4. Click the “Connect Server” button.
5. If the *SERVER_HOST* is a UNIX machine, follow steps 3 through 5 in the “For UNIX Systems” above. If the *SERVER_HOST* is a NT machine, continue with these instructions.

   Log on to the *SERVER_HOST*. Double click (or run, if you telnet to the machine) the ens7sv.exe icon located in the *INSTALL_DIRECTORY*\machines\win32 folder.
6. In the resulting application console window, enter the name of the *CLIENT_HOST* machine.

The Server should make the connection. To see if the connection is successful, you can click on the Info... button on the Desktop. You should see “Connection accepted” in the EnSight Message Window which comes up. Licensing information (licensee and expiration date) should also appear in the lower left corner of the Graphics Window. You should now close the EnSight Message Window and proceed to the next section.

If the connection failed, please consult *Troubleshooting the Connection* on page 1-17 before contacting CEI support.

Distributed Use - Automatic Connection

You can perform an *automatic connection* where the Server starts automatically and connects to the Client, even though the two processes are on different host systems. This type of connection requires some initial setup and is not discussed in the *Getting Started* manual. However, once configured, the automatic connection lets you start a session in a single step. See *How To Connect Automatically* in the online documentation for details. (For information on the online help facility, see *Using Online Help* on page 4-20.)

6.2 Reading a Dataset

In this demonstration, we will load a simple CFD model of the viscid, subsonic symmetric flow around a half-model of the shuttle orbiter. The dataset consists of the standard xyz (mesh) and q (results) PLOT3D format files.

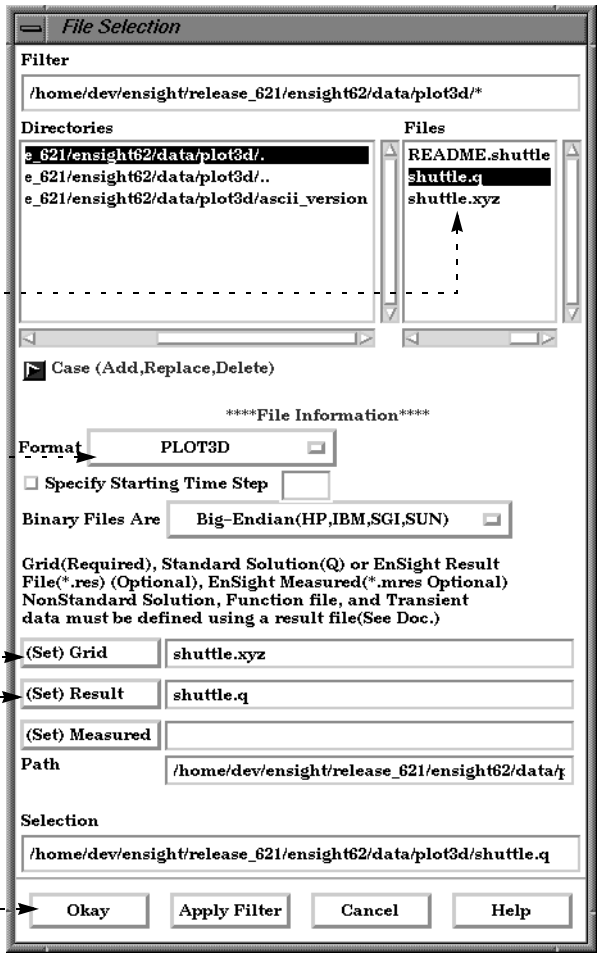
1. Select File > Data (Reader)... from the Main EnSight menu.

This opens the File Selection dialog.

For UNIX: Since we initially started EnSight (in the previous section) from the desired directory (`$ENSIGHT7_HOME/data/plot3d`), this directory is opened automatically (as seen in the Directories list).

For NT: You will be in the machines\win32 directory. You need to go up two levels by twice double clicking on the .. directory, then go down to `data`, then the `plot3d` directory.

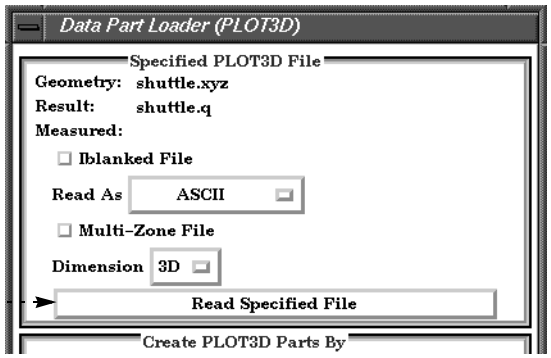
2. Click `shuttle.xyz` in the Files list.
3. Be sure the Format is set to PLOT3D.
4. Click (Set) Grid to set the geometry file to the file currently selected in the Files list (*i.e.* `shuttle.xyz`).
5. Click `shuttle.q` in the Files list.
6. Click (Set) Result to set the results file to the file currently selected in the Files list (*i.e.* `shuttle.q`).
7. Click Okay to accept the selections and close the dialog window.



When the File Selection dialog is closed, EnSight does not immediately read the file as in the previous example, but opens the Data Part Loader dialog for PLOT3D.

A number of different PLOT3D formats are supported by EnSight. For a complete description, see "How To Read PLOT3D Data" in the on-line How To documents or "Reading PLOT3D Data Files" in the on-line User Manual. EnSight scans the PLOT3D files to determine which format is being used. In most instances this results in the correct settings but it may, however, be necessary to specify in the Data Part Loader if the PLOT3D files are iblanked, if they are ASCII, Fortran Binary or C Binary format, if multiple zones (blocks) are present and if the model is 2D or 3D. Upon making the appropriate settings, the files are read by selecting "Read Specified File":

8. Click Read Specified File.



After the file has been read, the upper portion of the Data Part Loader becomes inactive (gray) and the lower portion is activated. The number 1 appears in the "Use Zones:" block to indicate that one block of 3D cells has been found in the xyz (mesh) file. The logical indices of this highlighted block appear in the "Using Node Ranges:" table.

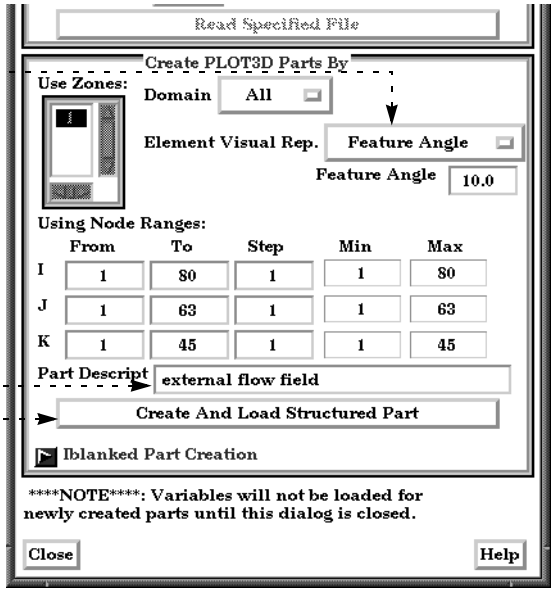
The lower section of the Data Part Loader dialog is used to create PLOT3D parts, as parts are not specifically defined in this format. The most basic part is the fluid flow region, in this case 8-noded hexahedral cells surrounding the surface of the shuttle geometry. For reference, this single block will be named by typing in a Part Description before creating the part. A second part, defined by the surface of the geometry, will be created by choosing an appropriate limited range of nodes (which are normally known by the author of the PLOT3D mesh). In this manner any number of surface parts may be created in addition to the 3D (fluid) parts. Note that the Data Part Loader may be used at any time to create new parts from the original PLOT3D data files.

9. Click Element Visual Rep. and change the setting to "Feature Angle".

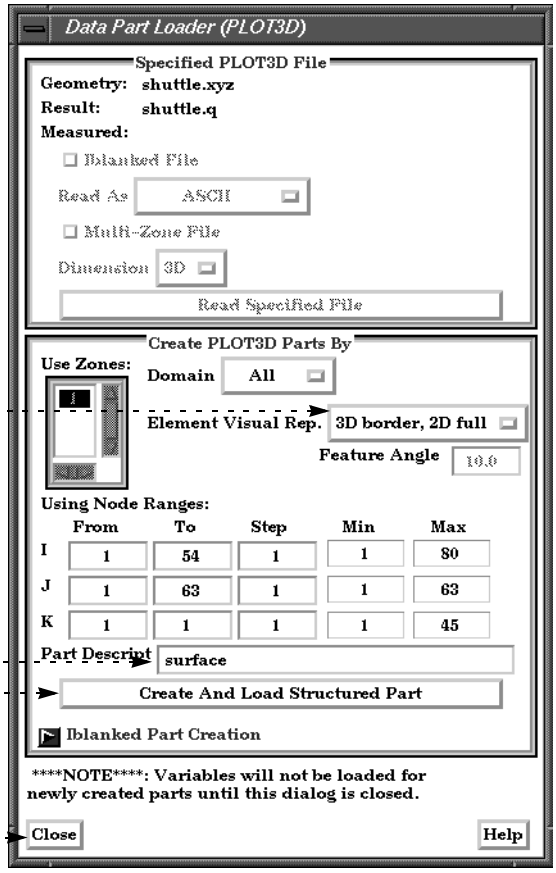
10. Type “external flow field”.

11. Click Create and Load Structured Part.

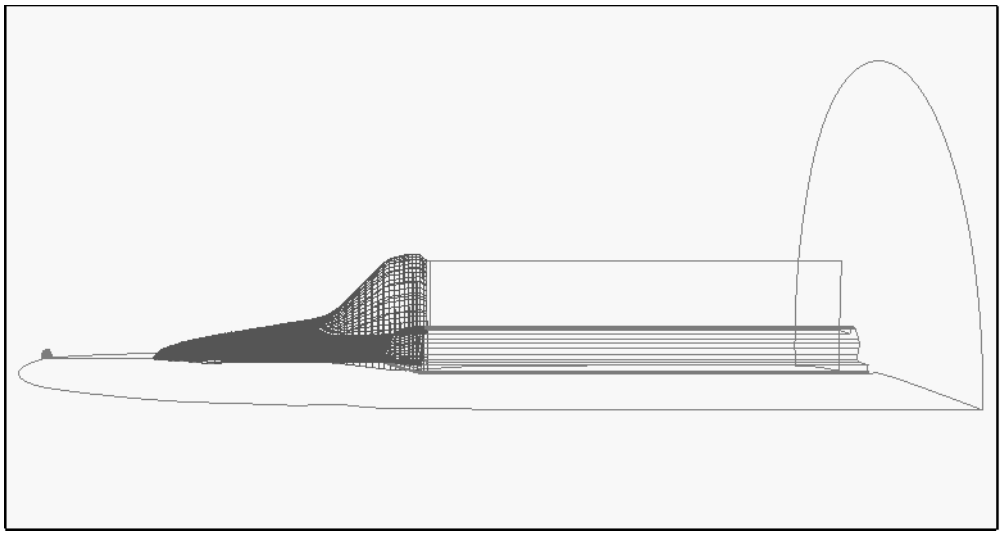
12. Change the "Using Node Ranges" to limit I indices to 1-54, the J indices to 1-63 and the K indices to 1-1 (the geometry's surface)..



13. Click Element Visual Rep. and change the setting to "3D border, 2D full".
14. Type “surface”.
15. Click Create and Load Structured Part.
16. Click Close.



The two created parts now appear in the Main Parts list. The external flow field is displayed as a wire frame and the surface is displayed as a mesh. As the flow field and geometry are both symmetric, only a half-model was used. The image in your Graphics window should appear as follows:



6.3 Feature Demonstration

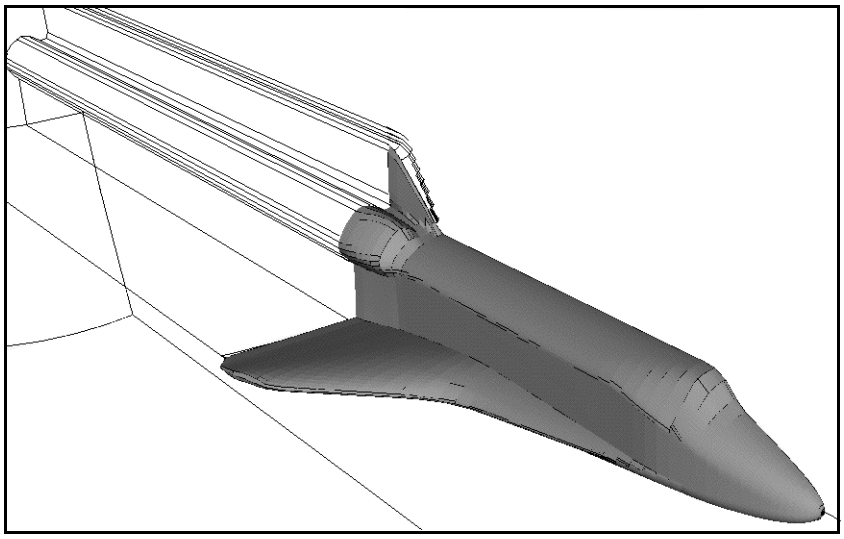
Unlike in the case of unstructured meshes as in the previous example, logical planes of a structured mesh may be viewed in addition to the arbitrary planes described using the plane tool. In this demonstration, constant I, J, and K planes will be created and used to display results.

First, change the display to shaded:

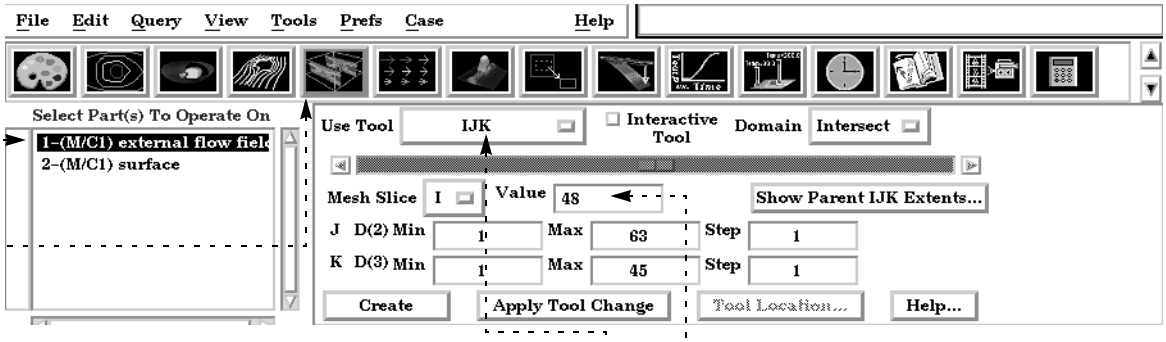
1. Click Shaded on the Desktop to enable shaded surface display for all parts. ☑Shaded ☐Hidden Line ☐Cursor ☐Line ☐Plane

2. Click Part in the Mode Selection area. Part

The image in your Graphics Window should appear as follows: (the model has been rotated for better visibility and the surface part has been colored a light gray)

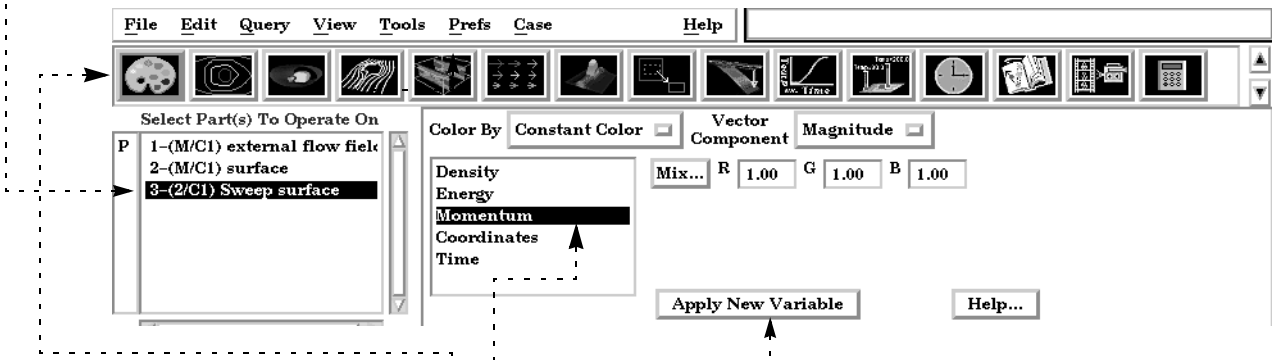


3. Select the “external flow field” part in the Main Parts list.



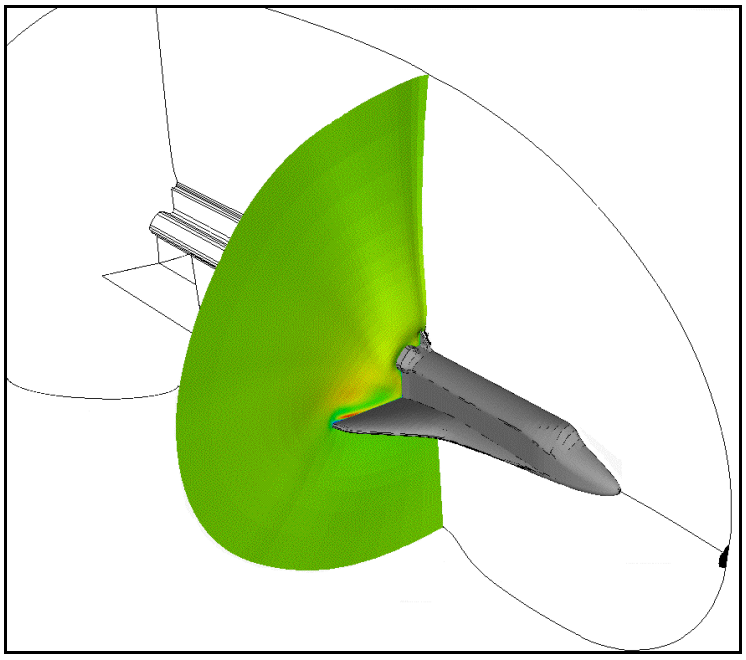
4. Click the Clip icon in the Feature Icon bar to open the Quick Interaction area for clip creation.
5. Click the Use Tool button and change the setting to IJK.
6. Change the value for an I Mesh Slice to 48 and press return.
7. Click Create.

Notice that a new part appears in the Main Parts list, "Sweep surface".



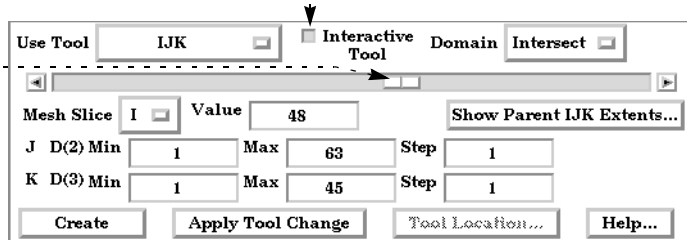
8. Click the Color icon in the Feature Icon bar to open the Quick Interaction area for Color.
9. Select the Momentum variable.
10. Click Apply New Variable in the Quick Interaction area to color the selected part by the selected variable. (Note that the Sweep surface part remained selected after its creation)

The image in your graphics window should appear as follows:



As in the previous example, it is possible to interactively manipulate the clip plane. In this case, however, the plane will move along a given logical coordinate as the slide bar is used.

11. Double click the Sweep surface part to bring up the clip quick interaction area.
12. Click Interactive Tool.
13. Move the slider to view different constant I Mesh planes
14. Change the Mesh Slice from "I" to "J" and "K" and use the slider to view different constant J and constant K mesh planes. Note that the Min, Max and Step settings can be used to limit the extent and resolution of these planes.



It is possible to use both IJK and arbitrary plane Clips within the same session of EnSight. The IJK Clip feature may also be used as an alternative to creating model parts via the Data Part Loader as described above.

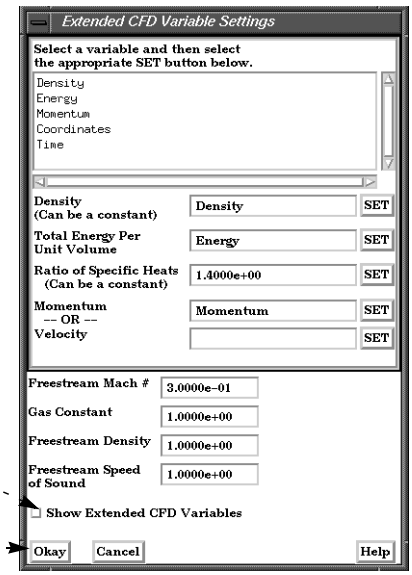
Extended CFD Variables

Often, the primitive variables solved by a given CFD code are of less interest than certain derived variables, for instance the Mach number, defined as the ratio of the local fluid speed to the freestream speed of sound. In the aerospace community, a number of these derived quantities are referred to as the "PLOT3D functions", as they were available in the program PLOT3D. EnSight includes most of these functions, and enhances their original form in two important ways. First, these Extended CFD Variables may be computed based on the "q file" variables of the PLOT3D format, namely the scalars density and energy and the momentum vector. In this case, EnSight makes the appropriate mapping of the variables. If, however, PLOT3D files are not used, or if the PLOT3D variables are used in a non-standard fashion, the user may define the appropriate mapping between the variable names as they were defined in the results and those quantities needed by EnSight to create the desired extended variable. The second enhancement is the ability to define any value for the ratio of specific heats, Cp, or use a scalar variable to define a different Cp value at each node of the mesh.

15. In the Main Menu, Select Edit > Preferences..., then select Variables from the Preference list and click Modify Extended CFD Variable Settings....

This opens the Extended CFD Variable Settings dialog

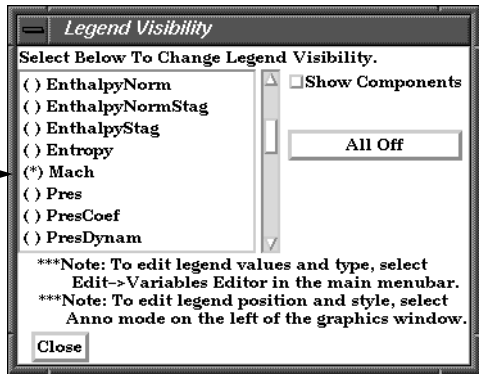
16. Click Show Extended CFD Variables.
17. Click OK.



The Variable list now contains the original variables as well as the Extended CFD Variables. As with all others, these variables will not be activated until they are needed, for instance to color a model part. The activation of the extended variables involve a computation requiring one or more of the primitive variables. This, in turn, will require their activation, which EnSight performs automatically. All activated variables will remain so until they are explicitly deactivated. Note also that some extended variables (for instance vorticity) involve complex computations which may require significant time to complete.

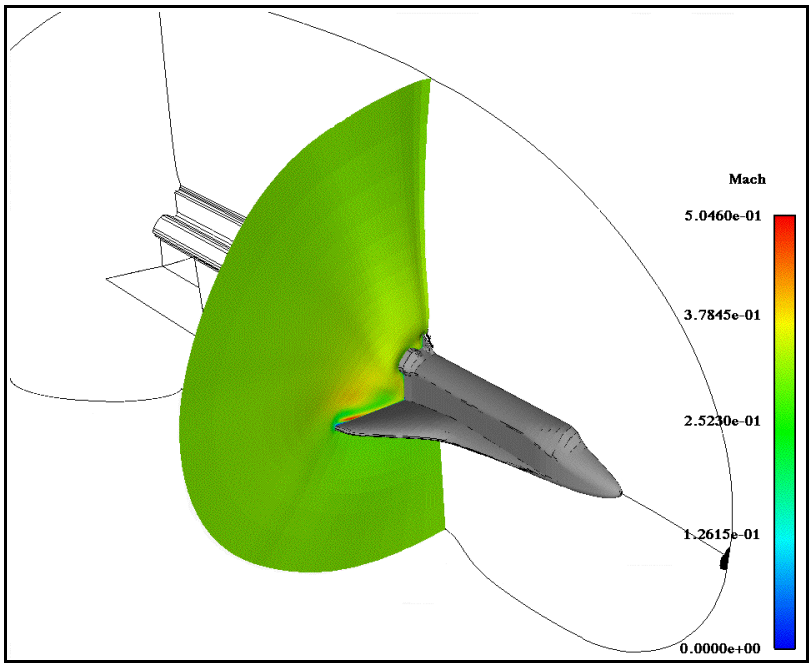
18. Click the Legend... button on the desktop. - - - - - ➤ **Legend...**

19. Select Mach in the Legend Visibility Dialog. - - - - - - - - - - - - - - ➤



20. Perform steps 10. and 11. (page 5-8) again to color the Sweep surface part by Mach number.

The image in your Graphics Window should look something like the following:



See *How To Create Variables* in the online documentation for more information.

6.4 Where's the Rest?

After successfully completing this tutorial, you should proceed to the next demonstration. Although the next tutorial contains some material applicable to all users, it is intended primarily for analysts doing structural mechanics (finite element) analysis.

The online documentation contains details on the operations covered in the chapter. The following online articles are relevant to the topics covered here.

Consult...	For More Information On...
How To Read PLOT3D Data	specifying PLOT3D format results data to read into EnSight
How To Create IJK Clips	creating clip surfaces in structured models
How To Create Variables	creating extended CFD variables

7 Structural Mechanics Example

This chapter provides step-by-step instructions for performing basic postprocessing operations – especially those relevant to non-linear dynamics (*e.g.* crash) analysis. Unlike the two previous datasets, the data used here is *transient* – it varies over time. EnSight provides a wide range of features for postprocessing and animating transient data.

After successfully completing this chapter, you should be able to:

- group multiple parts into a single part,
- show geometry displacements,
- probe for data values,
- change time steps,
- perform a query and plot it,
- add annotation to an image,
- create a flipbook animation.

7.1 Starting EnSight

If you successfully performed the installation verification as described in *Verifying the Installation* on page 1-15, you have already started EnSight and connected the Client and Server processes. The same operation will be performed here.

To start EnSight, execute the following instructions for your particular installation type (stand-alone or distributed).

Starting EnSight for Stand-alone Use

If your installation of EnSight is stand-alone (*i.e.* the Client and Server are both running on the same workstation), you can use these simplified steps to start EnSight and auto-connect the Client and Server processes.

For Unix Systems:

You should be logged in to the console of the workstation on which the EnSight Client and Server have been installed. In addition, the `ENSIGHT7` environment variables, as well as your command search path, must be set up correctly as described in page 1-8.

1. Change to the directory containing the crash dataset. (The dataset contained in this directory will be loaded into EnSight in section 7.2.)

   ```
   % cd $ENSIGHT7_HOME/data/guard_rail
   ```

2. Start EnSight using the `ensight7` shell script:

   ```
   % ensight7
   ```

For NT Systems:

1. Choose EnSight7 from the Start > Programs menu.

This will automatically start the Client and the Server and make the connection. To see if the connection is successful, you can click on the Info... button on the Desktop. You should see “Connection accepted” in the EnSight Message Window which comes up. Licensing information (licensee and expiration date) should also appear in the lower left corner of the Graphics Window. You should now close the EnSight Message Window and proceed to the next section.

If the connection failed, please consult *Troubleshooting the Connection* on page 1-17 before contacting CEI support.

Starting EnSight for Distributed Use

If your installation of EnSight is distributed (*i.e.* the Client and Server are running on different computer systems), use the steps given below to start EnSight. Note that this operation is a *manual connection*. EnSight can be set up to perform the connection automatically. See *How To Connect Automatically* in the online documentation for details.

In the instructions that follow, *`CLIENT_HOST`* refers to the system on which the EnSight Client was installed and *`SERVER_HOST`* refers to the system on which the EnSight Server was installed.

The instructions also assume that the ENSIGHT7 environment variables as well as the command search path have been set up correctly as described on page 1-8.

For UNIX Systems:

1. Log on to the console of *CLIENT_HOST* and open at least two shell windows. Since the EnSight user interface will open on the right side of your screen, place the two shell windows on the left side.
2. In the first shell window, start the EnSight Client:

   ```
   % ensight7.client -cm
   ```

   The -cm option tells the Client to begin listening for a connection from the Server. The EnSight Client user interface should appear on your workstation screen.
3. In the second shell window on your workstation, log on to *SERVER_HOST*:

   ```
   % telnet SERVER_HOST
   ```

4. In the second shell window, change to the directory containing the crash dataset. (The dataset contained in this directory will be loaded into EnSight in section 7.2.)

   ```
   % cd $ENSIGHT7_HOME/data/guard_rail
   ```

5. In the second shell window, start the EnSight Server:

   ```
   % ensight7.server -c CLIENT_HOST
   ```

   The -c *CLIENT_HOST* option tells the EnSight Server to connect to the EnSight Client listening on *CLIENT_HOST.*

For NT Systems:

1. Log on to the *CLIENT_HOST*. Double click the ens7cl.exe icon located in the *INSTALL_DIRECTORY*\machines\win32 folder.
2. Bring the Connection dialog up, by File > Connect Server...
3. Change the “Type” to “Manual”.
4. Click the “Connect Server” button.
5. If the *SERVER_HOST* is a UNIX machine, follow steps 3 through 5 in the “For UNIX Systems” above. If the *SERVER_HOST* is a NT machine, continue with these instructions.

   Log on to the *SERVER_HOST*. Double click (or run, if you telnet to the machine) the ens7sv.exe icon located in the *INSTALL_DIRECTORY*\machines\win32 folder.
6. In the resulting application console window, enter the name of the *CLIENT_HOST* machine.

The Server should make the connection. To see if the connection is successful, you can click on the Info... button on the Desktop. You should see “Connection accepted” in the EnSight Message Window which comes up. Licensing information (licensee and expiration date) should also appear in the lower left corner of the Graphics Window. You should now close the EnSight Message Window and proceed to the next section.

If the connection failed, please consult *Troubleshooting the Connection* on page 1-17 before contacting CEI support.

Distributed Use - Automatic Connection

You can perform an *automatic connection* where the Server starts automatically and connects to the Client, even though the two processes are on different host systems. This type of connection requires some initial setup and is not discussed in the *Getting Started* manual. However, once configured, the automatic connection lets you start a session in a single step. See *How To Connect Automatically* in the online documentation for details. (For information on the online help facility, see *Using Online Help* on page 4-20.)

7.2 Reading a Dataset

In this demonstration, we will load a transient dataset of a car crash into a guard rail. The dataset includes displacement and plastic strain values.

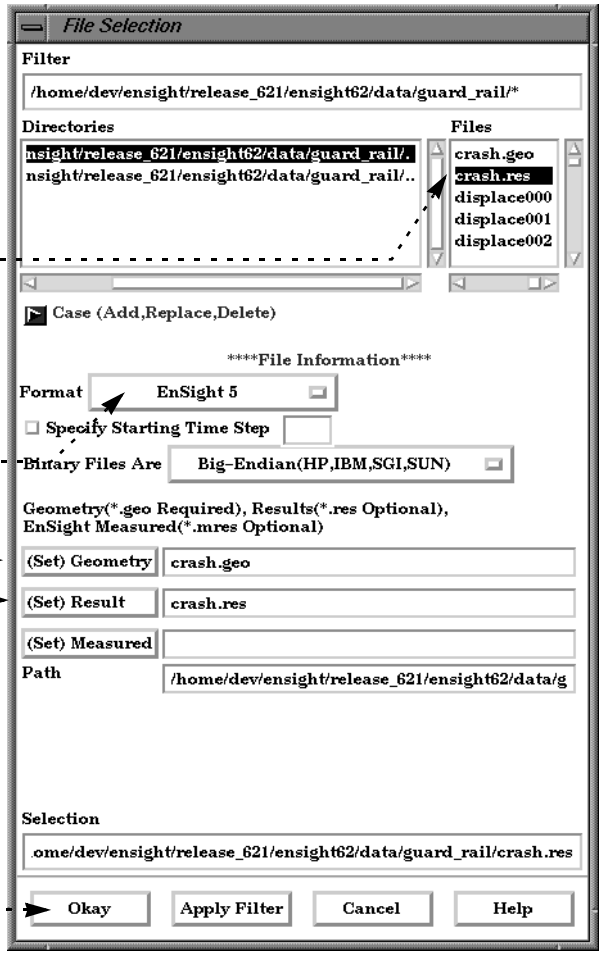
1. Select File > Data (Reader)... from the EnSight Main menu.

This opens the File Selection dialog.

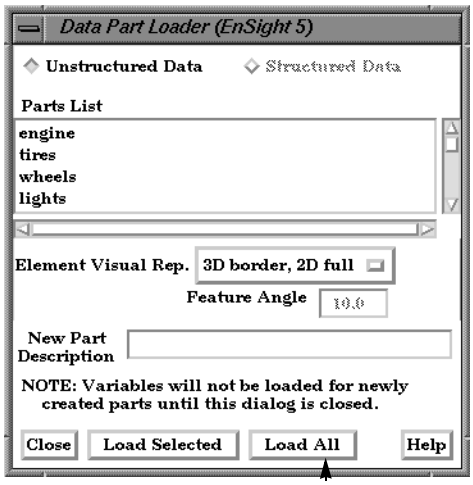
For UNIX: Since we initially started EnSight (in the previous section) from the desired directory (`$ENSIGHT7_HOME/data/guard_rail`), this directory is opened automatically (as seen in the Directories list).

For NT: You will be in the machines\win32 directory. You need to go up two levels by twice double clicking on the .. directory, then go down to `data`, then the `guard_rail` directory.

2. Click `crash.geo` in the Files list.
3. Set the Format to EnSight 5.
4. Click (Set) Geometry to set the geometry file to the file currently selected in the Files list (*i.e.* `crash.geo`).
5. Click `crash.res` in the Files list.
6. Click (Set) Result to set the results file to the file currently selected in the Files list (*i.e.*`crash.res`).
7. Click Okay to accept the selections and close the dialog window.

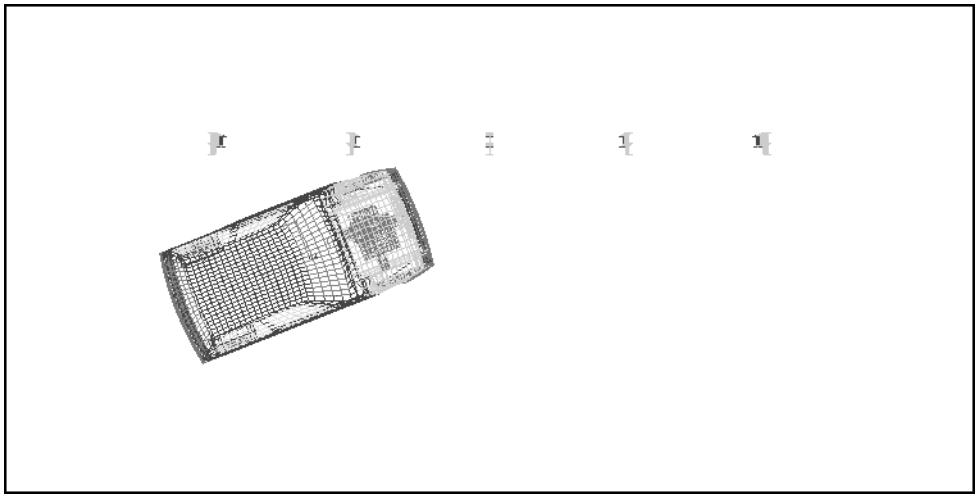


When the File Selection dialog is closed, EnSight reads the file and opens the Data Part Loader dialog. During the initial read, EnSight determines the individual parts available in the file and allows you to selectively load any or all parts.



8. Click Load All.
9. Click Close.

The constituent parts are now listed in the Main Parts list and displayed in the Graphics Window:



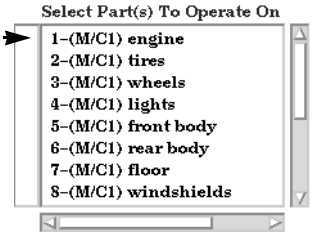
Note: *To improve the legibility of the* Getting Started *manual, all images of the Graphics Window are shown with a white background rather than the default black background that EnSight uses.*

7.3 Feature Demonstration

In many types of analysis, multiple parts are used to distinguish between various components or material types. To the extent allowed by the particular data format, EnSight maintains this distinction by assigning these entities to separate model parts. In some cases, however, this distinction is no longer useful for postprocessing. When manipulating objects in EnSight, you often want to apply the same attributes or operators to a group of parts. If the group is large, this process can become unwieldy. Fortunately, EnSight provides a mechanism, called *grouping*, for grouping multiple parts into a single group part. The original parts comprising the group will no longer be visible in the list.

In this example, we will group all parts associated with the car into a single part.

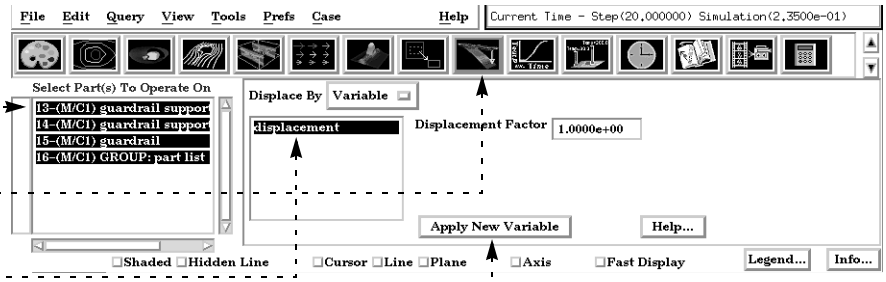
1. Select all the parts associated with the car: place the mouse pointer over the first part in the Main Parts list, click the left mouse button, and drag down until parts 1–12 have been selected.
2. Select Edit > Part > Group.
3. Enter “car” in the “Group Name?” prompt that appears.
   Note that parts 1–12 are removed from the list.



The interesting parts are now the four parts at the end of the Main Parts list: three parts for the guard rail and the new group part (named “GROUP: car”).

EnSight can displace geometry based on the value of a vector variable. Each displacement vector represents a translation of a node from its original position (an offset).

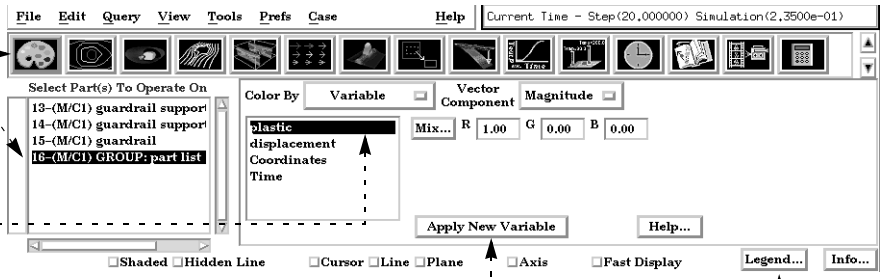
4. Select the three guardrail parts & the Group part.
5. Click the Displacement icon in the Feature Icon bar to open the Quick Interaction area for Displacements (you will have to scroll the Feature Icon bar to reveal the icon).
6. Select the displacement variable.
7. Click Apply New Variable.



Note the new positions of the car and the guard rail. See *How To Display Displacements* in the online documentation for more information.

Now color the car by the plastic strain variable.

8. Select the "GROUP: car" part in the Main Parts list.
9. Click the Color icon in the Feature Icon bar to open the Quick Interaction area for Color.
10. Select the plastic variable.
11. Click Apply New Variable in the Quick Interaction area to color the selected part by the selected variable.
12. Click Legend..., select the plastic variable to display the color legend for the selected variable.

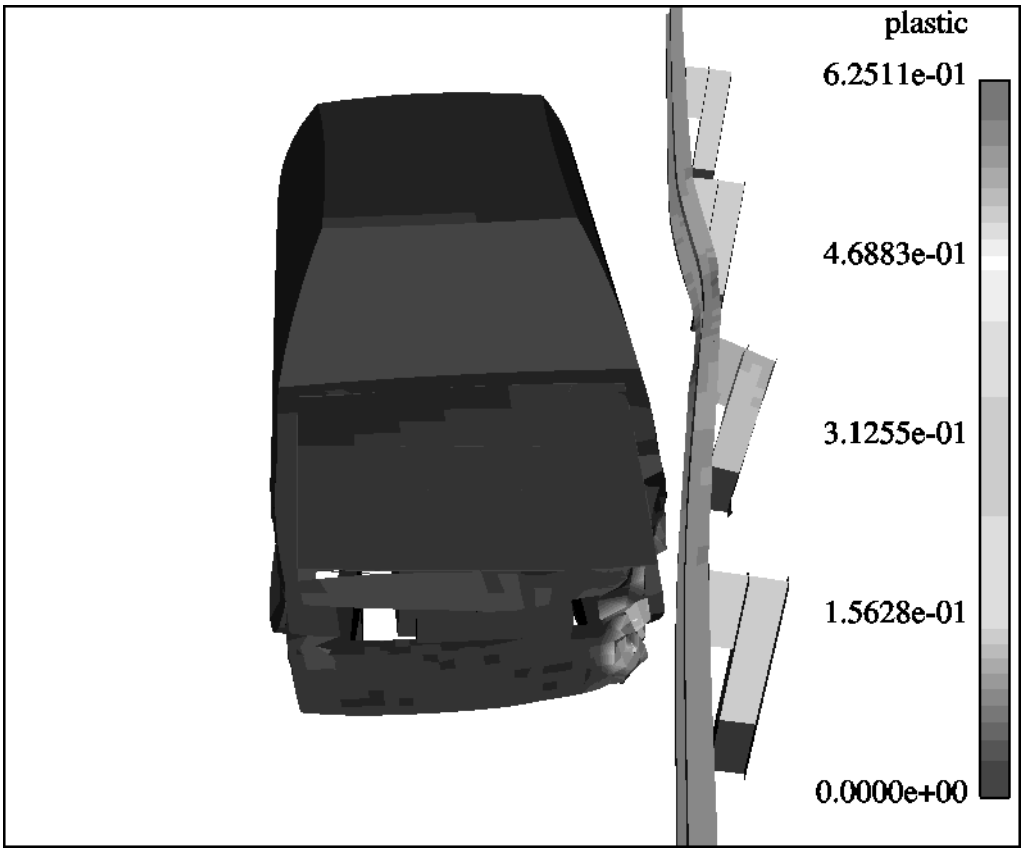


The color legend appears to the right of the model in the Graphics Window. Color legends have many display attributes – see *How To Create Color Legends* in the online documentation for more information.

Change the display to shaded:

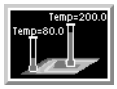
13. Click Shaded toggle on the desktop.

14. Rotate and zoom the model until the view in the Graphics Window looks something like the image on the next page.



EnSight provides an interactive probe tool that uses the mouse pointer to select points of interest.

15. Click the Probe icon in the Feature Icon bar to open the Quick Interaction area.



16. Select the plastic variable.
17. Change the Query to Surface Pick.
18. Move the mouse pointer into the Graphics Window and place the pointer over the car. Click the “p” key on the keyboard.

The value of the plastic strain variable is calculated for the point under the mouse and displayed. A marker (the sphere) is also displayed. The default size of the marker is a bit large in this case.

19. Click Display Attributes... to open the Interactive Probe Query Display Attributes dialog.
20. Double-click in the marker size text field, type “20”, and press return.

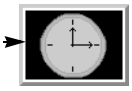
Note that you can also set the color of the text or marker with this dialog.

21. Click Close to remove the dialog.
22. Change the Query back to None.

See *How To Probe Interactively* in the online documentation for more information.

By default, EnSight initially displays the last time step. However, it's easy to change timesteps.

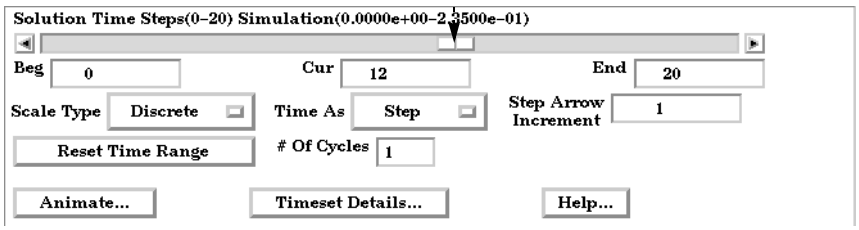
23. Click the Solution Time icon in the Feature Icon bar to open the Solution Time Quick Interaction area.



The Solution Time Quick Interaction area provides several methods for working with time. Perhaps the easiest way to change time steps is to use the slider bar.

24. Place the mouse pointer over the slider bar. Click the left mouse button and drag the bar until the value in the Cur field is "12".

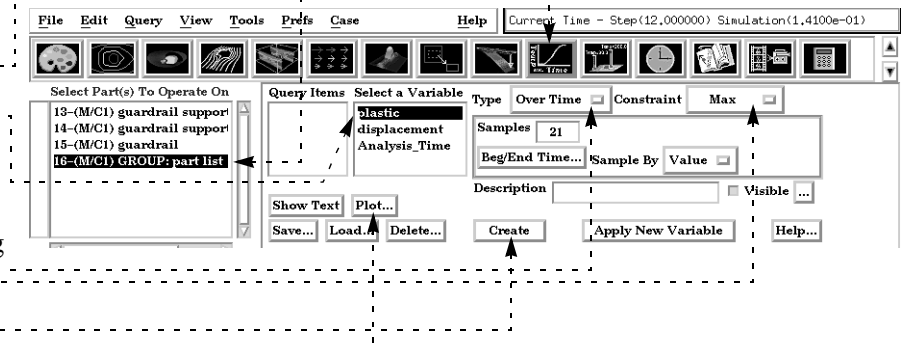
25. Release the mouse button.



Note that the geometry in the Graphics Window has updated to reflect the data at the new time step. See *How To Change Time Steps* in the online documentation for more information.

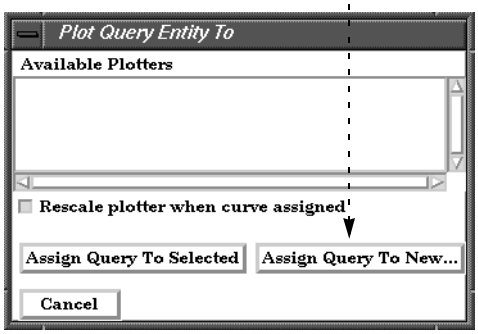
EnSight provides powerful query and plot features. Query/plot is fully integrated with the transient data handling facility so that plots will automatically update during time changes. Here we will query for the maximum plastic strain over all timesteps

26. Select the "GROUP: car" part in the Main Parts list.
27. Click the Query/Plot icon in the Feature Icon bar to open the Quick Interaction area.
28. Select the plastic variable.
29. Change the Type setting to Over Time.
30. Change the Constraint setting to Max.
31. Click Create.



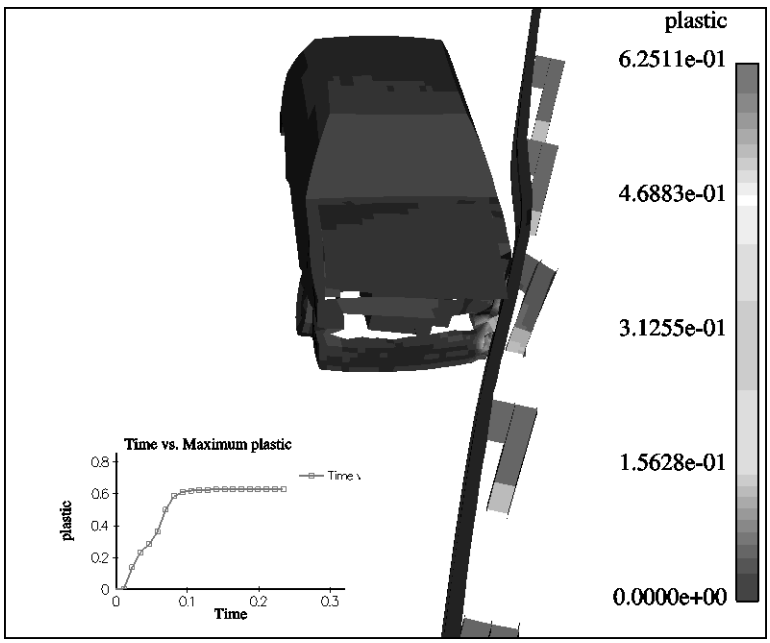
A new query entity appears in the list named "Time vs. Maximum plastic". To plot the query:

32. Click Plot... to open the Plot Query Entity To dialog.
33. Click Assign Query To New... and click Okay in the New Plotter Name dialog to accept the assigned name.



The plot appears in the lower left corner of the Graphics Window. See *How To Query Over Time* in the online documentation for more information. Plot Mode provides control over the appearance of plotters and curves – see *How To Change Plot Attributes* for more information.

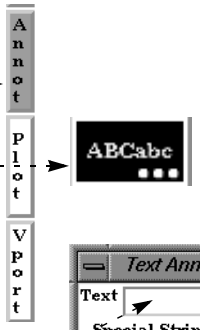
Your Graphics Window should look something like the following:



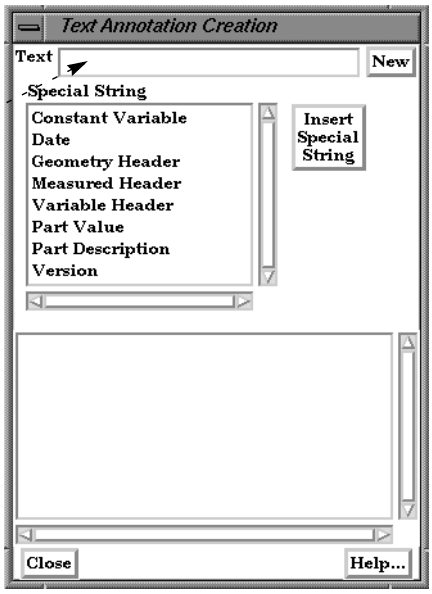
7.4 Annotation

Many postprocessing tasks require the production of hardcopy (or video) output with various types of annotation. EnSight provides comprehensive features for annotation: text, lines/arrows, color legends, and bit mapped logos.

To add text annotation:



1. Click Annot in the Mode Selection area to enter Annotation mode.
2. Click the Text Creation icon to open the Text Annotation Creation dialog.
3. Click in the Text field and type “Car Crash”.
4. Click the New button to display the text in the Graphics Window.



This operation creates a new text object. The object is currently selected (as seen by the green handles). To move the text:

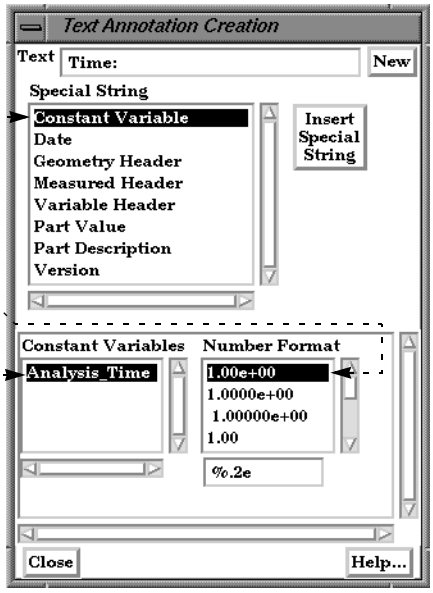
5. Move the mouse pointer into the Graphics Window and over the text. Click and hold the left mouse button and drag the text up. Release the button.

You can also resize the text.

6. Place the mouse pointer over the right-angle handle in the lower right corner (just below and to the right of the “h”).
7. Click and hold the left mouse button and drag the handle to the right to increase the size of the text.

EnSight supports several “special strings” that let you automatically display constant variable values as well as various internal values. For example, you can have a text string that displays the current solution time. When the time step is changed, the text automatically updates.

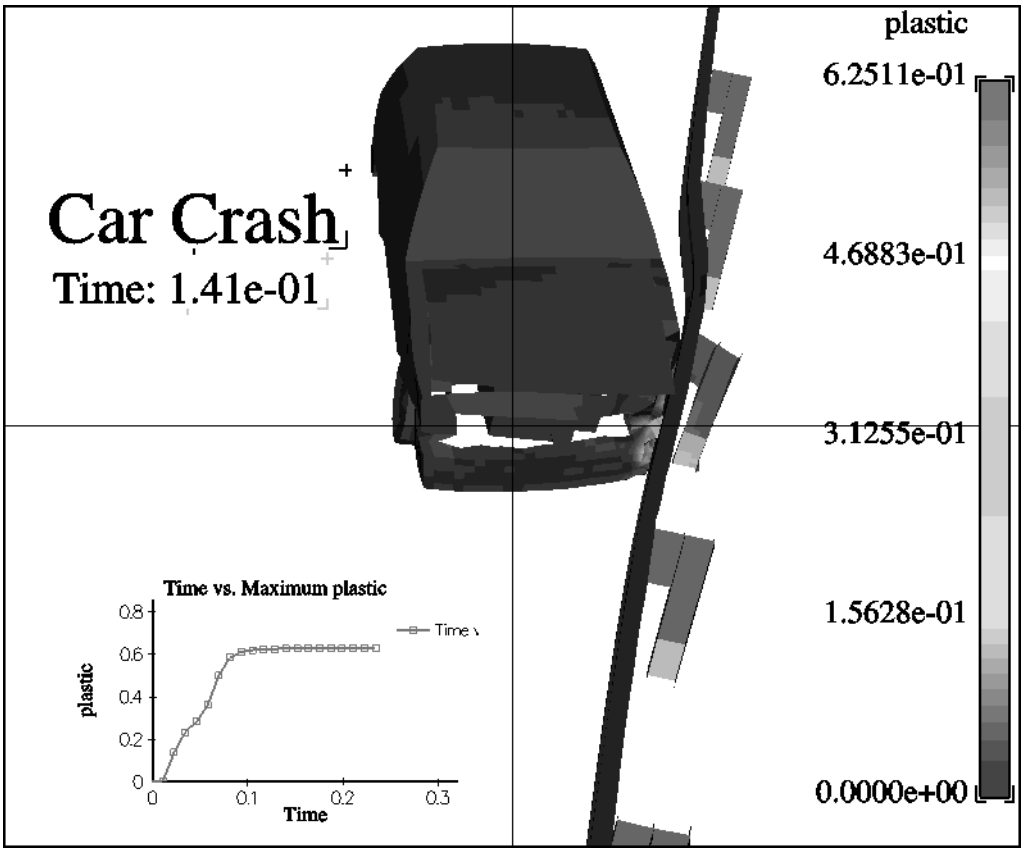
8. Highlight the “Car Crash” string in the Text field to select it.
9. Type “Time: ”.
10. Click to select Constant Variable in the Special String list.
11. Click to select Analysis_Time as the variable to use.
12. Click on the “1.00e+00” item to select the print format for the string.
13. Click the Insert Special String button to insert the special code into the Text field.
14. Click the New button to display the text in the Graphics Window.
15. Click Close to remove the dialog.



The text “Time:1.41e-001” appears in the Graphics Window. This value corresponds to the solution time at time step 12.

16. Move the mouse pointer into the Graphics Window and over the new text string.
17. Click and drag the text until it is under the “Car Crash” text.

Your Graphics Window should look something like the following:



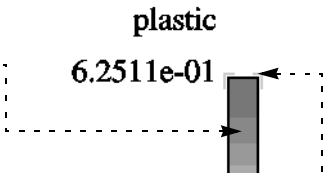
If you change time steps (as described on page 7-10) or load a new flipbook (as we will do on page 7-16) the text will automatically update to reflect the current time.

See *How To Create Text Annotation* in the online documentation for more information.

As you have seen, EnSight can display color legends for any variable. You can also control the appearance of color legends in Annotation Mode.

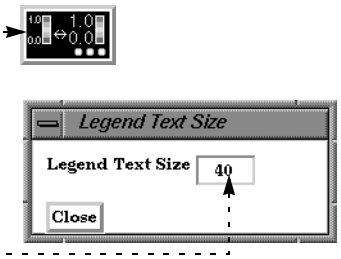
Like other annotation objects, color legends have handles that you can grab to resize and reposition the object.

18. Move the mouse pointer into the Graphics Window and over the color bar area of the legend. Click and hold the left mouse button and drag the legend down slightly.
19. Move the mouse pointer over the upper right handle. Click and hold the left mouse button and drag down to shrink the vertical size of the legend.



You can also control the size and format of the legend text.

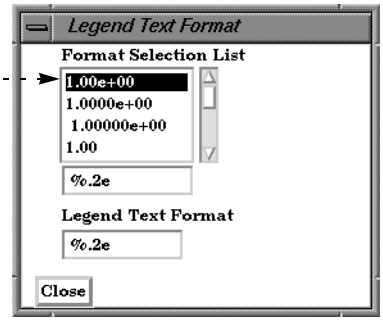
20. Click the Legend Text Size icon (you will have to scroll the vertical Mode Icon bar to reveal it) to open the Legend Text Size dialog.
21. Double-click in the size field to select the text, type “30” and press return.
22. Click the Close button to remove the dialog.



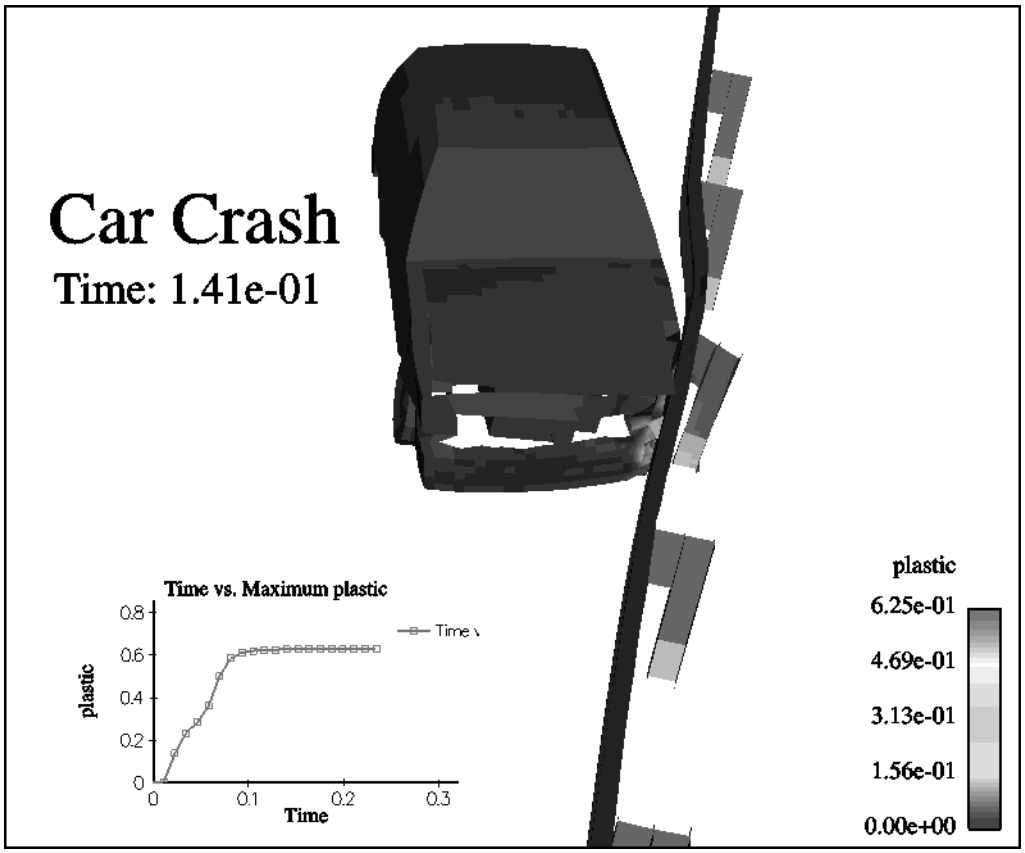
23. Click the Legend Text Format icon to open the Legend Text Format dialog.
24. Click to select the first item in the Format Selection list.

Note that the variable labels have been reformatted. EnSight uses standard C language *printf* formats for floating point number display. You can enter your own custom format in the Legend Text Format field if you like.

25. Click the Close button to remove the dialog.
26. Click Part in the Mode Selection area and move the mouse pointer into the Graphics Window (to clear Annot Mode).



Your Graphics Window should look something like the following:



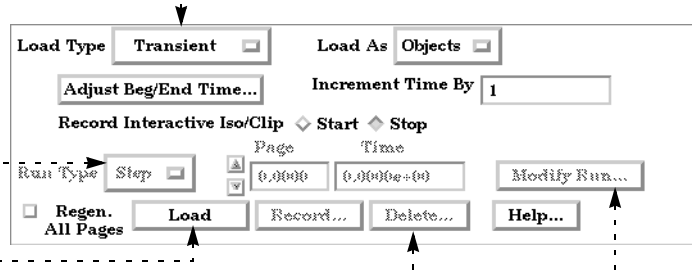
See *How To Create Color Legends* in the online documentation for more information.

7.5 Flipbook Animation

In many cases, dynamic phenomena can only be understood through interactive exploration as a transient dataset is animated. EnSight provides this capability in a *transient flipbook*. The process of creating a flipbook begins with an initial load. During this process, EnSight builds 3D graphics objects from the existing parts modified by the results at each time step. Once loading is complete, the objects can be replayed as fast as the graphics hardware permits while still allowing transformations (such as rotation).

To load a flipbook:

27. Click the Flipbook icon in the Feature Icon bar to open the Quick Interaction area for Flipbook Animation (you may have to scroll the Feature Icon bar to reveal the icon).
28. Be sure the Load Type is set to Transient.
29. Click Load to begin the loading process.

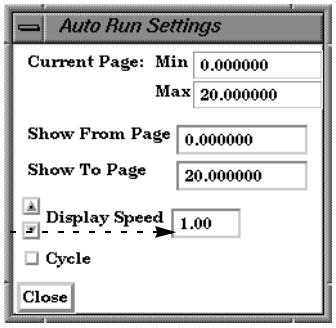


The Load Flipbook Status dialog displays the progress of the load. Once the load is complete, you can play the animation.

30. Change the Run Type to Auto and move the mouse pointer into the Graphics Window.
31. Use the mouse to rotate the model while the animation is playing.

Note that both the plot and the time variable text update during playback. By default, the animation plays as fast as the graphics hardware permits. In some cases (for small models or very fast hardware), this can be too fast. To adjust the display speed:

32. Click Modify Run... to open the Auto Run Settings dialog.



33. Double-click in the Display Speed field, type ".5", and press return.

A setting of .5 will run at half of full speed.

34. Click Close to remove the dialog and move the mouse pointer back into the Graphics Window to view the change.
35. When you are done viewing the animation, click Delete to remove the flipbook frames from memory.

See *How To Animate Transient Data* in the online documentation for more information. For greater animation control, EnSight also provides a *keyframe animation* system – see *How To Create a Keyframe Animation* for details.

7.6 Where's the Rest?

The online documentation contains details on the operations covered in the chapter. The following online articles are relevant to the topics covered here.

Consult...	For More Information On...
How To Group Parts	grouping parts into a single part
How To Display Displacements	displaying displacement variables on parts
How To Probe Interactively	probing interactively with the mouse
How To Create Text Annotation	creating annotating text
How To Create Lines and Arrows	creating annotating lines and arrows
How To Create Color Legends	displaying and modifying color legends.

8 Where Do I Go From Here?

After completing the *Getting Started* tutorials, we suggest the following approach to learning EnSight:

1. Load one of your own datasets and practice the techniques presented here with your results. See Chapter 4, *Getting your Data into EnSight*, for information on existing interfaces.
2. Learn new features by using the articles in the *How To* documentation. Both the *How To Table of Contents* and the *How To Index* (accessed from the main Help menu) are good places to search for the topics you need. Clicking the Help buttons in the dialog windows is also a good way to find topics of interest.

Support

CEI provides comprehensive support services for EnSight. If you are evaluating EnSight for purchase or have an active support and maintenance contract, contact CEI Support at:

Email:	ensight_support@ceintl.com
Hotline:	800-551-4448 (U.S)
	919-363-0883 (Non-U.S.)
Fax:	919-363-0833

The support hotline is staffed from 8:00 AM to 5:00 PM EST except during U.S. holidays. If you are outside the U.S., please contact your local distributor of EnSight for support.

Software Maintenance

CEI is constantly working to improve both the quality and functionality of EnSight. New major releases are automatically shipped to all customers with an active support and maintenance contract. From time to time, bug-fix releases are made available via CEI's anonymous FTP server (`cei-gate.ceintl.com`). If you have suggestions or requests, please contact CEI Support.

Training

Training courses are held regularly by CEI and in conjunction with CEI's international distributors. Courses may be arranged at customer facilities. Contact your EnSight representative for details.

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